



SATURDAY, MARCH 9, 1872.

Gas-Burning Locomotive Head-Light.

The use of the products of petroleum for illuminating purposes has opened a field for invention and improvement which those engaged in the manufacture of all kinds of lamps have not been slow to improve. Our engraving will show that invention has been applied to locomotive head-lights, as well as to lamps used for ordinary domestic purposes. The illustrations represent sectional views of an improved gas head-light, manufactured by the Radley & McAllister Manufacturing Company of New York.

BB is an ordinary parabolic reflector, *x* the burner,

v is a wire netting interposed between the burner and the lower part of the chimney, to prevent the communication of the flame from the one to the other. The vessel *h* is also surrounded by a perforated plate, *s, s*, for the same purpose.

The tank *A* is filled by unscrewing cock *a*, the latter being intended to allow any undue pressure to escape. *b* is a glass gauge to show the quantity of the fluid in the tank. *c* is a cock to open communication from the tank to the vessel *h*. The pipe *F*, fig. 1, is connected with the main pipe and extends up inside the pipe *d* to the top of the tank *A*. Its object is to allow any gas, which might produce an excessive pressure in the chamber *h* when the cock *c* is closed, to escape into the tank *A*, and thus be condensed.

Those head lights have now been in use for several years, and the manufacturers have some five or six hundred of them in daily, or rather nightly, operation. The Baltimore & Ohio Railroad, the Philadelphia, Wil-

Contributions.

THE SOUTHERN ROUTE TO THE PACIFIC.

NUMBER THREE.

SAN FRANCISCO, February 29, 1872.

Civilization had its genesis in the rainless country of Egypt, on one continent, and the almost equally rainless countries of Peru and Mexico, on the other. Egypt was totally rainless until within comparatively recent times, when slight showers have been induced by the extensive forest-planting ordered by the present Khedive. In Peru the inhabitants secure a supply of water from the heavy condensations of dew; in Mexico, on the elevated tablelands, they are compelled to resort to irrigation. These vast, arid *mesas* of Western Texas, New Mexico and Arizona have probably even a better rain-supply than middle Mexico, certainly better than Peru. And in the

Fig. 1.



Fig. 2.

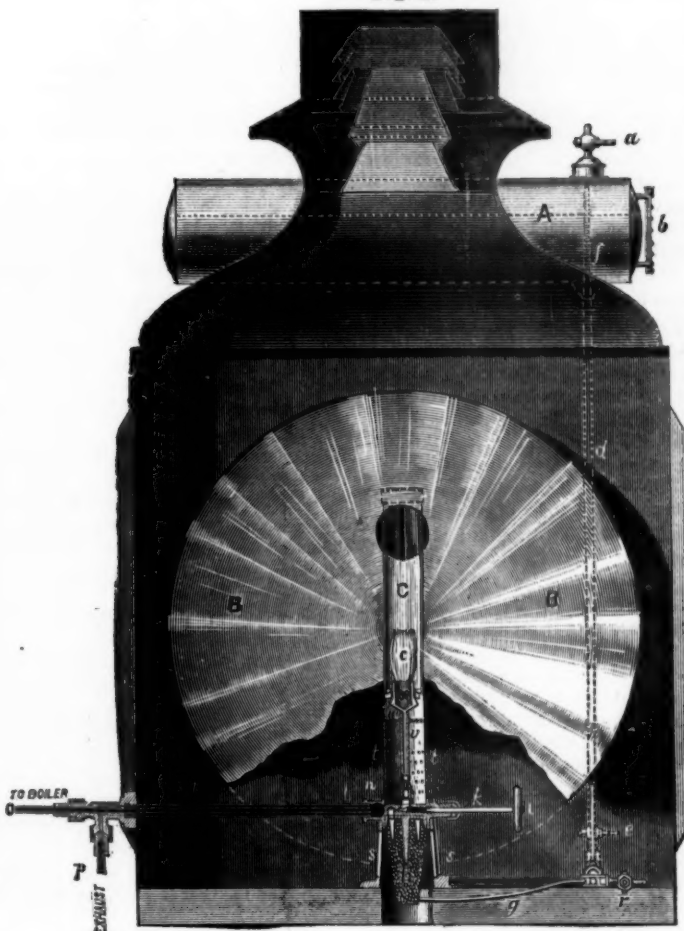


Fig. 3.

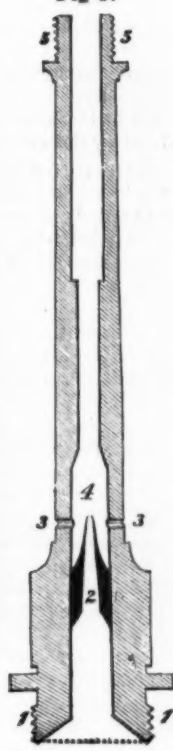


Fig. 4.

C the lamp chimney. The gas is produced by vaporizing by the heat of steam gasoline—which is a volatile product of the distillation of petroleum. The gasoline is contained in a tank, *A*, and is carried down by the pipe, *d, e, g*, to the chamber, *h*, fig. 2. This is filled with excelsior wood shavings. The top of this chamber is made of brass, and has a number of long projections extending down some distance into it and among the shavings. The top has also a chamber of a horse-shoe form, shown in section in fig. 2, and in plan in fig. 4. This is connected with the boiler by a steam pipe, *l, l*, which is inclosed inside of an exhaust pipe. The effect is a constant circulation of steam into and through the chamber, *m, m*, fig. 4. By this means the whole top of the vessel *h* is heated, and the heat is communicated by the projections, before referred to, to the shavings, which are saturated with gasoline. In this way it is vaporized and escapes through the opening, *n*, and tube, *v*, to the burner, *x*. *k* is a valve stem with a small conical valve on the end, to close the communication between the vessel, *h*, and the burner.

The tube *v* is represented on an enlarged scale in fig. 3. The vaporized gasoline passes through the small orifice *4*, and thus creates a current of air through the holes *3, 3*, which mingles with the vapor. The combination of the vaporized gasoline and atmospheric air forms a very inflammable gas with a high illuminating power. To the top of the tube *v* is attached an ordinary argand burner, *x*.

mington & Baltimore, the Erie and a number of other roads are largely equipped with them, and we have received very favorable reports of their operation from locomotive superintendents and runners.

Stealing Rides.

The Norwalk (Conn.) *Gazette* is responsible for the following:

"An amusing state of affairs has recently been developed on the express trains out of New York. For a long time the railroad company has been annoyed by persons stealing rides on the trains, getting on at Twenty-seventh street and jumping off at Harlem Bridge. In order to put a stop to this unremunerative traffic, the doors of the cars have been locked and kept locked until the train passed from the Harlem to the New Haven track, thus caging the offenders, who are then charged full fare to the next stopping place, Stamford, and are obliged to pay their way back again. Last Friday afternoon an amusing case occurred. In due time the doors were locked, and, as the train approached the bridge, a man got up and took a number of fowls from under the seat and started for the door, but found himself caught in a trap. Not to be outdone in that manner, he coolly started for a window which he opened, threw the fowls out, then his hat and coat, and tried to get out himself—but ingloriously failed, and was carried out to Stamford bareheaded and coatless, minus his chickens. On Saturday a gentleman came up who had three ladies waiting for him in a carriage, but as he could not get out he contented himself by going to a window, touching his hat and kissing his hand to his fair friends as the train dashed on, and made the best he could of the situation."

article of soil, a good moiety of these lands leave little to be desired.

In view of the notable success which has attended recent experiments with artesian wells in the vicinity of Los Angeles—in consequence of which the system is now about to be initiated in the immense country of San Diego—these *mesas* are far from hopeless. They have a perceptibly heavier rainfall (statistics are lacking) than San Diego County, receiving rain through the winter for about the same length of time as the average rainy season of Southern California, which is supplemented by about six weeks of additional showers, beginning toward the last of July. True, they are void of ocean moisture, and the atmosphere is indescribably dry, clear and keen, sucking the moisture from the earth with disastrous rapidity. So do the vernal northers of Central California, sweeping down the great basin of the Sacramento and Joaquin.

The cry everywhere now in these regions of California, among intelligent farmers, is for trees, hedges, groves, orchards—anything to break these pitiless, dry winds. So, on the great plains of the interior, the one only hope is in tree-planting. Artesian wells and irrigating ditches first, as a primary means; trees as a secondary means, a defense against wind and a lodestone to the clouds, also for their own intrinsic value; crops as the end. In this sign the farmer of the plains shall conquer, if at all.

The San Francisco Academy of Sciences has determined that, during one of these desiccating northerners of the interior, the proportion of moisture in the atmosphere sometimes falls to nineteen per cent., one per cent. below Sahara. I believe the atmosphere of the plains of Western Texas and New Mexico would often show even a lower figure than that.

The wind on most of those great table-lands is execrable; during daylight it seldom ceases. It must be made to subjugate itself, its batteries must be turned against its own battalions. *Fung Shui*, wind and water, wind producing water. The windmill is the means of doing it. If there is any one distinctive thing that California has given to American agriculture and American landscape, it is the windmill—not the great, drowsy engine of Holland, heaving its mighty flukes around in the lazy air, but a pert, smirk-looking affair, neatly painted white, and running so glibly, American-like, that it seems to be one solid wheel. It is a pretty and a suggestive sight to see one of these clipper wheels about Sacramento, or on the vast plains around, working hard all a summer's day, shooting out a stream of cool water, while the tranquil farmer has to disturb himself only a few times a day by going and turning the hose down some other channel, toward a new place in the crop.

The windmill will help greatly in the conquest of the stubborn, windy plains of Western Texas. The day will come, perchance, when the passengers by the Texas Pacific Railroad shall look out from their windows, as they bowl like a buffalo over the yellow plains, and see all the expanse dotted with those engines of the future. There the wooden Aquarius shall stand through the summer weather, astride of the well, and with a mighty tank on his shoulder, which it will be his daily task to fill many times and empty over the thirsty waste.

There are few persons in the country to-day who have any just conception of the important function the windmill is destined to fill in the future subjugation of our great deserts, or of the debt owed to California for this so simple machine. The well, the windmill, the tree—this is the triple combination which will wrest from these hard wastes their hidden treasures—for treasures many of them certainly have deep in their bowels of good soil.

In my last letter we had crossed the dreadful Llanos Estacados, and descended into the valley of the Pecos. This singular stream really has no valley, for it rushes like a canal right athwart a desert plain, sometimes twenty, thirty, forty miles in width. It is only four or five rods wide, steep-banked and deep, and has no greenery along its shores save a few willow twigs and tall canes, so that the course of the river is not perceptible at the distance of a mile. In mid-summer, when the desert is driest, it is angry, swift and blood-red, being swollen by the melting of mountain snows; but for the most part of the year the water of it is scarcely potable for alkali and salt.

Near it are many pools of alkali, clear and sparkling as spring-water, but deadly as the Aqua Tofana. Some of the cattle, after their dreadful march, rushed in and began to drink, and they frequently fell dead in the pool. Over 1,200 head perished from our herd in one day, either swept down by the river, or bogged in the oozy silt, or over-filled with water, or poisoned in alkali pools.

Immediately along the river there are narrow strips of good soil, from a few rods to a quarter of a mile wide, frequently sweet and white with alkali, otherwise covered pretty thick with clumps of a harsh, stiff grass called by the Mexicans *feno blanco* (white grass). It yields quite good and sappy pasturage even to the end of the spring dry season (about July 25), and what few cattle were left recruited very well thereon. A few Mexicans grow little patches of *frijoles* (brown beans), garlic and onions on these narrow strips, by irrigating them with buckets. They venture out into the mesquite brakes half a mile or so, spread down an ox-hide, clean the beans on it by pouring them down through the wind, in the course of three or four days grub a cartfull of mesquite roots, then get their oxen together again, go in, and sell the roots for fuel to the military station at Horsehead Crossing.

Nineteen-twentieths of the Pecos plains (say of a zone forty miles wide) are an utterly hopeless desert, being only gravel or sand, covered with mesquite and *cheriondia* bushes. During the daytime the sand drifts constantly and heavily from the south, so that it permeates even the food, the bedding, everything. All the banks of the river are strewn with whitening bones, and with skeletons shrinking away in hideous skins ungnawed, for even the raven and the coyote, foulest of foul beasts, seem to slink away from this veritable Valley of Death. Of all hideous and ghastly places that I have seen on earth, I think the plains of the Pecos are the most hideous and the most ghastly.

The road ascends the Apache Mountains along the bed of Olympia Creek, through the golden, magnificent and gorgeous Olympia Canon, then slowly up mile after mile

between perpendicular, basaltic walls of reddish-brown granite, which sometimes approach so close together as to leave barely room for the creek and a railroad. Were it not for this insignificant yet spiteful stream, which in winter sometimes gets its back up terribly, this would be an admirable natural railroad cut, not to be improved by art; and it is the only one anyhow in that vicinity.

There is also a remarkable provision of nature for a railroad way across the main mountain. There is a cut which is just as if a strip of the level plain, five miles wide and twenty long, had been taken up and let right down a thousand feet deep across the backbone of the mountain. Thus for twenty miles through the heart of the sierra the builders will have only to make an easy track, as on the Llanos Estacados.

In the eastern end of this singular pass, like the eye in a peacock's feather, is a little lake of living water, sweet and good. The margin of prairie around it for two miles back is honeycombed by myriads of prairie-dogs, the sure sign of a fertile soil; and here, on an area of perhaps six miles square, the grass was green and full of heart in July, after three months without a shower, and 1,800 cattle fed on it for two weeks greedily. Probably every animal in the train left that fine lacustrine prairie fifty pounds improved in flesh, on an average, above what it had on arrival. This, be it remembered, in the very heart of the Apache Mountains, though this lake is really only a few hundred feet above the level of the Llanos Estacados. Fort Davis is five miles from this lake, chucked into a niche in the foot of an enormous, towering wall of gray granite, coolly bestowed beneath a bright-green grove of cottonwoods. It may well be believed that this scenery was a surprise and a delight to us, after coming up off the hideous plains.

These mountains are very sparsely wooded with a miserable, scraggy growth of mountain cedar and live-oak, worthless for all uses except for fuel. Sixty miles to the northwest, however, opposite El Paso, they produce a fine body of pine-trees.

In the mountains the rainy season begins earlier (about July 15) than in the valleys, and thereby we were deceived nearly to our ruin. Starting from Fort Davis after the season had well set in, we found the valleys only a few hundred feet lower still in the gripe of the drought, and only a timely rain saved us from a repetition of the awful disaster by the Pecos.

The first valley below the pass is that of the Agua del Muerto, ten or fifteen miles in width. I never saw anywhere so much thoroughly good land so utterly naked as this valley. It is one hopeless desert of deep, rich, brown loam. Here and there is a *bianaga* (a kind of bush-cactus), with a trunk as large as a man's thigh, and its large lemon-colored or pale apple-red blossoms load the hot, still air with a sickish sweetness. Cantaloupes grow wild, but unprofitable for man or beast. The salamander *palmilla* shows by its size the strength of the soil. But, aside from these semi-tropical shrubs, there is scarcely a green sprig in all the waste, no drop of water, no breath of fresh air, and the heat is great, but tempered like that of California.

As you go on ten or twelve miles further toward the Rio Grande, the loam changes to gravel; and from that on to the great river, eighty or ninety miles, though the valleys are immensely broad, they are entirely worthless, even with water.

STEPHEN POWERS.

Eastern Engineering from a Western Point of View.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It has often been remarked that although the railway system was first developed in the Eastern States, yet it is in the West that we must look to find its fullest development. While the solid men of Boston were caving in the tops of their hats against the low ceilings of the cars in which they rode to and from the offices where they controlled the stocks of half the roads in the West, the passengers on these Western roads were enjoying the height and airiness of Pullman palace cars. This continued for several years, and when at last one of these gilded palaces found its way into Massachusetts, those who had never been West were struck dumb with wonder that such luxury could exist and they not know it.

Large iron bridges (built with Eastern capital) were first seen on the Mississippi and Missouri. These bridges required large draws. The art of constructing these draws has reached such perfection that engineers now call for draws 440 feet long, feeling sure that there are plenty of bridge-builders ready and able to construct them.

But to build a street draw, not 200 feet long, seems to have been too much for the mechanical skill of both Boston and Providence, although aided by half a dozen generals as consulting and executive engineers.

The city of Providence has been trying since 1869 to open a draw 250 feet long, built by the Moseley Compa-

ny, and has now pulled it all down in utter despair of ever making it work.

The city of Boston, to judge from the report of T. Willis Pratt, C. E., is in no better position. The inevitable General Moseley has been there, too, and has built a draw. Mr. Pratt is a sort of Mark Tapley in his way, and is determined to be cheerful under difficulties. He tells us he first tested the draw by passing the Irish procession on the 17th March over it, following the rule of the old physicians: *Fiat experimentum in corpore vili*. Thanks to the guardian care of St. Patrick, the bridge did not break down; but the wheels under the draw began to crush. "The best mode of testing them," Mr. Pratt says, "was to put them into place and try them." As fast as they broke he would take them out and replace them. This is slow and sure engineering. We fear it would not be appreciated in Chicago.

When the steel track began to give way, and had to be cut out piecemeal by boring holes through it with a ratchet drill, this caused some delay; but cheerful Mr. Pratt says the time was well spent in putting in the gearing, hot-air engines, etc., by which the bridge is to be moved.

Nobody knows whether it will move or not, but good Mr. Pratt is not cast down. "If after more experience it is found best to alter the gearing or increase the power by putting in new engines, it can easily be done, as all the parts are accessible." How would Western railway presidents relish this sort of cut-and-try engineering upon their large draw-bridges?

Finally, after telling us that the suspension rods are not rightly placed, etc., etc., Mr. Pratt winds up by saying, "I believe that thus far the engineering, machine and mechanical work of this bridge may be considered a success," and goes on to say that, though not as durable as the pyramids of Egypt, "it is a good specimen of the iron skeleton architecture of the present age." If this is a success, what are the failures? and if this is a good specimen, Heaven defend us from the bad ones, whether they be iron skeletons or any other sort.

Strength of Steam Boilers.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The extensive use of boilers as generators and reservoirs of steam to be used as motive power makes it important that, in their construction, the strength of the several parts should be justly proportioned to the strain they will be required to bear. As there is some diversity of opinion among boiler makers upon this subject, I will endeavor to argue the question briefly, and in as elementary a manner as is practicable.

The shape of the boilers in general use is that of a cylinder with flat ends. This shape, it will appear, does not yield the greatest strength from the least material. But the practical advantages that result are greater, it is thought, than the loss resulting from the waste of material.

Both the longitudinal and transverse rupture of a cylindrical boiler is resisted by the absolute strength of the material of which it is constructed; but the proportion of material to transverse strain is double its proportion to longitudinal strain, from which it follows that a boiler will rupture longitudinally from one-half the pressure that would be required to rupture it transversely.

Rupture of the flat ends of the boilers, however, is not resisted by the absolute strength of the material. It is found from theoretical considerations, combined with experiment, that beams or plates, fixed at both ends, will support, if uniformly distributed over their surface, a weight $w = \frac{6 s b t^2}{l}$; in which l is the length, b the

breadth, and t the thickness of the plate, and s is the absolute strength of a unit of material (in this case boiler plate); and therefore s = about 50,000 lbs. And when the plate is supported all around, as is the case with the ends of boilers, the value of the weight is doubled; that is, $w = \frac{12 s b t^2}{l}$. If the diameter of the boiler be 40

inches and the thickness of the plate $t = \frac{1}{4}$ inch, w will equal 150,000 lbs., which will be about 120 lbs. per square inch for the maximum pressure that the end will bear. As this is much less than the pressure that the sides will bear, if made with $\frac{1}{4}$ inch plate, it is found to be necessary, and is the custom with boiler makers, after making the flat end of plate double the thickness of that used for the side, to still further strengthen the ends by bracing them firmly within, where the attachment of flues does not give the necessary additional support.

As the total pressure upon the internal surface of a boiler is the elastic force of the steam upon a unit of surface multiplied by the whole internal surface, some mechanics mistake this total pressure for the efficient pressure which tends to produce rupture of the boiler. It is easy to show, by resolving the forces in the direction in which the rupture must take place, that this is not the case, and

that the efficient force which tends to produce *transverse* rupture is the elastic force of the steam per unit of surface multiplied by the area of a transverse section of a boiler, and that which tends to produce *longitudinal* rupture is the same unit of force multiplied by the area of a longitudinal section whose plane coincides with the central axis of the boiler. The same conclusion may be deduced in a more elementary manner, as follows:

Imagine a rigid plane to divide the boiler longitudinally into two equal parts, then will the length of the plane be equal to the length of the boiler, and its width will equal the diameter of the boiler, and, consequently, its area may be represented by ld , l being the length and d the diameter of the boiler. And suppose now that longitudinal rupture occurs, and that the lines of rupture coincide with the edges of this imaginary plane, then, if p represents the unit of pressure, because action and reaction are always equal, but in contrary directions, and because the reaction upon the plane would be ldp , therefore the efficient force which would produce longitudinal rupture is the product of the pressure per square inch into its length, in inches, multiplied by the diameter of the boiler in inches.

The total resistance that a boiler opposes to longitudinal rupture is $2lst$. Therefore, when rupture occurs, we must have $ldp = 2lst$, or $p = \frac{2st}{d}$ (1.) That is, if we suppose the

diameter of the boiler to be 40 inches and the thickness of plate $\frac{1}{2}$ inch, we shall have for the maximum pressure $p = 375$ lbs. Here we have estimated the absolute strength, s , at 30,000 lbs., allowing a loss of 40 per cent for rivets. The resistance the same boiler opposes to transverse rupture is $\pi d st$, and hence when transverse rupture shall take place we must have $\frac{1}{2} \pi d st = \pi d st$

$$\text{or, } p = \frac{4st}{d} \quad (2.)$$

Comparing (1) and (2), we perceive that the same boiler would carry just twice as many pounds of steam (per square inch) before it would suffer transverse rupture as would be required to produce longitudinal rupture. This is only true, however, in long boilers, as in short boilers the attachment of the ends increases their resistance to longitudinal rupture.

J. E. HENDRICKS.

Des Moines, Iowa, February 14, 1872.

Glass Bearings.

The use of glass bearings for the wearing surfaces of cross-heads, pistons and other working parts of machinery has been steadily extending for a number of years past. We give an engraving herewith of the mode which has been adopted by Mr. Harden of applying the bearings which he supplies to cross-heads and piston-packing rings. The illustration is so plain that hardly any description is necessary. In the slides of the cross-head they are simply imbedded in holes drilled or cast to receive them, and in piston rings they are inserted in grooves turned in the rings. The following directions are given by the manufacturer for putting in such bearings:

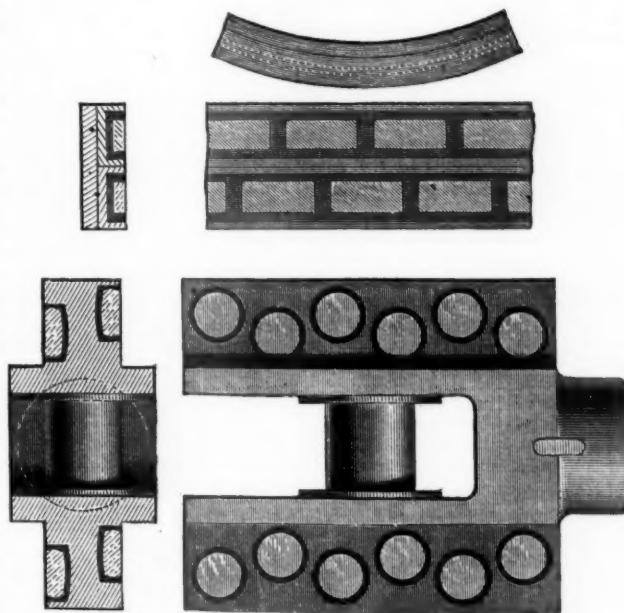
"Drill the holes full one-fourth of an inch larger in diameter than the glass is, and at least one-sixteenth deeper than the glass is thick. The holes should be chipped under with a center chisel in several places in order to hold the babbitt well. Then take a parallel piece of iron large enough to cover the hole, and perfectly smooth on one surface, place a little oil on the smooth surface and press the piece of glass to it. By this means you exclude the air, and the glass and iron will stick together firmly; this is done in order to hold the glass up from the bottom of the hole, and thus allow the babbitt to run under as well as around it, forming a perfect bed for the glass to rest on. Place the piece of iron with the glass fast to it over the hole in such a manner as to keep the glass in the center, and also leave a small space uncovered through which to pour the babbitt. The glass should be slightly above the surface of the working part, in order to take the full bearing to give it this rise. Place at least one thickness of writing paper between the parallel piece and the other surface; clamp the parallel piece to the gibb or other part, for if not clamped the glass is likely to rise too high above the surface while the babbitt is being poured. Caulk the babbitt in several places with a blunt center-punch between the glass and iron, then scrape it down to the surface. All bearings put in locomotive cross-heads should not be more than flush with the surface.

"To insert the bearings in cylinder packing-rings, eccentrics, etc., a groove should be cast or turned in the center of sufficient depth and width to allow the babbitt to run under and around the glass; the groove should be turned under and also chipped rough on the sides. Then bend a strip of sheet-iron to the exact radius, and make the proper surface smooth, then stick five or six pieces of glass to the smooth surface by means of putty or any other substance that will stick well. Then clamp the sheet iron with the glass fast to it to the ring or other

part; close up one end with putty, and pour the babbitt in the other end. When the glass is all inserted, take oil and emery with a file and grind the glass down to the surface, making sure that not one of the glasses are above the surface when the ring is finished.

"In parts where there is not sufficient thickness of material to allow the babbitt metal to be run under the glass, one thickness of muslin may be used as a bed for the glass to rest upon."

We examined a few days ago a set of piston-packing rings intended for the propeller Philadelphia, which is one of the largest steam vessels on the lakes. The cylinders are 36 inches in diameter. Our engraving represents a portion of them, which is shown in three different views, elevation, plan and cross-section. Most persons, we believe, would be surprised to find how much rough usage a piece of glass will bear if properly imbedded in a soft metal. We saw some of the pieces represented in



Harden's Anti-Friction Glass Bearings.

our engraving tested with a hammer, and found that if they are well fitted they will stand a considerable number of quite severe blows without being fractured.

These bearings are now very extensively used in locomotives and stationary engines, and the manufacturer is furnishing them to all parts of the country and for all kinds of steam-machinery. Judging from their success, it seems probable that the use and application of glass for wearing surfaces will increase rapidly, and that a greater variety of ways of applying it will be adopted. The manufacturer of the bearings which we have illustrated (Mr. John Harden, of No. 48 Broad street, New York) has met with very great success in introducing them, and finds the demand steadily increasing.

Gradienter Surveying.

BY HERMANN HAUPT, C. E.

An experimental survey has just been completed for the extension of the Shenandoah Valley Railroad, from Covington, Va., to Russellville, Tenn., the results of which, as regards economy and rate of progress, are so extraordinary that a brief account of the system which has been adopted may not prove uninteresting.

The number of miles surveyed was 800; the whole time in the field about five months; the whole cost of the survey, \$1,850, of which \$1,050 was for salary of the assistant in charge, leaving only \$800 to cover expenses of wagon and party, including supplies and outfit.

A considerable portion of the route was through brush and laurel thickets, where roads were cut for the ox-wagon which carried supplies.

The average daily progress was 3 miles, maximum $7\frac{1}{2}$ miles; but on long summer days 10 miles in open ground would be practicable.

The instrument used was Wüldemann's gradienter, to which stadia wires for reading distances by means of rods had been added.

DESCRIPTION OF GRADIENTER.

The gradienter consists of a light but very powerful telescope, with attached spirit level and compass box, horizontal limb graduated from zero to 360 deg., circular spirit level attached to limb, and instead of vertical limb, a peculiar arrangement for measuring angles of elevation, called a *percentage screw*.

This is the ordinary form of the gradienter as manufactured for the Coast Survey Department, but to adapt it to railroad experimental surveys, three stadia wires were added, the middle horizontal wire intersecting the vertical wire in the axis of the telescope, the other two forming spaces having the relative proportion of 1, 2 and 3.

The percentage screw is the great feature of this instrument. It is finely and accurately cut, and carries a horizontal disc of about $1\frac{1}{4}$ in. in diameter, on the periphery of which are 100 subdivisions. This disc revolves

in contact with a vertical graduated scale, and the parts are so calculated and adjusted that one complete revolution of the percentage screw corresponds with one division of the scale, and each division marks 1 foot in 100 of elevation or depression. The percentage screw subdivided this foot into 100 parts with surprising accuracy, showing great nicety of mechanical construction.

In testing the instrument at a distance of 500 feet, the elevations as determined by the percentage screw would seldom vary more than an inch from true levels; and although this would not be sufficiently accurate for canal surveys or railroad final locations, yet for experimental lines such an instrument is of great utility, and it can be used as an ordinary level with less rapid progress where great accuracy is required.

RODS.

The rods used were of peculiar form, constructed by the writer to facilitate the reading by the assistant of levels and distances at the same time. Each rod consisted of two pieces 3 inches wide, $\frac{1}{4}$ inch thick and 10 feet long, connected by hinges so as to shut together like the leaves of a book, and thus protect the graduation from abrasion. One side of these rods was graduated in feet, tenths and hundredths from the bottom up, and read as an ordinary leveling rod by the assistant. The other side was graduated from the top down for distances, by first measuring accurately 500 feet, and marking the space covered by the extreme wires. This space being subdivided into five parts, each part would represent a distance of 100 feet, and each of these spaces was again subdivided into 100 parts, representing feet. The graduation was peculiar and very legible.

MODE OF USING THE GRADIENTER AND RODS.

The adjustments of the instrument are simple, but as the threads of some of the most important screws are fine and delicate, care must be taken not to strain them.

The instrument being adjusted, the first operation consists in leveling by the sensitive circular level attached to the horizontal plate. Next, to bring the zero of the percentage screw in contact with the zero of the scale, when the level attached to the telescope should also be horizontal. If it is not, the instrument is out of adjustment. Next, place the zeros of the vernier and limb in juxtaposition and clamp them. Next, turn the other end of the telescope toward the north and unscrew the needle; when the needle has settled, bring the zero of the compass arc to it by means of the tangent screw and clamp firmly. The telescope is now in the direction of the meridian and the verniers at zero; the needle may now be screwed up; it is not used for reading courses, but only to determine the meridian, for which purpose it is made long and sensitive. The vernier is now unclamped and the courses read from 0 deg. to 360 deg.

The observer now turns the telescope to the back rod, and, bringing the top hair to the top of the rod by means of the percentage screw, reads and records the distance and the course.

Next bring the zero of the percentage screw to the zero of the scale. If the rod can be seen, the level can be read at once; if not, the telescope must be elevated or depressed, so as to bring the middle wire against the rod. It is most convenient in practice to turn the percentage screw a given number of complete revolutions, as it renders calculation more simple. A single example will be sufficient for explanation.

Suppose the distance as recorded is 480 feet, that the level from the observer strikes below the bottom of the rod, and that the telescope has been elevated five turns of the percentage screw to bring the rod into view; as each turn corresponds to 1 foot in 100, five turns would be five feet, and in a distance of 480 feet, the elevation of the line of sight would be $4.80 \times 5 = 24$ feet above the level. If this line should strike the rod at a reading of 5.42, then $24 - 5.42 = 18.58$, which would represent the level of the instrument below the bottom of the rod, and the reading would be entered in the column of back sights 18.58.

Suppose the ground continued to descend, and the forward sight should read 30.20, the difference of level between the two stations, equal to the difference between the back and forward sights, would be $30.20 - (18.58) = 11.62$. It will be perceived that by this system *negative* rods can be read, which is not possible by the ordinary system of leveling, where, if the line of sight strikes below the rod, the instrument must be moved to a higher level. It is also possible, by means of the percentage screw, to read *positive* rods of 40 or 50 feet, with considerable accuracy, and thus avoid the short intermediate stations required in ordinary leveling.

The survey of the Shenandoah Valley extension, just completed by O. Bartlett, Jr., is the first upon which this system of surveying has been used. The results, however, are very satisfactory. The cost per mile, as compared with former surveys, has not been more than one-fourth, and the daily progress double. The engineer records at each setting of the instrument courses, distances, total distances, back sight, forward sight, total level and slopes. It is not absolutely necessary that a man in his party should be able to read or write, but it is convenient to have an ax-man who can mark stations. One ax-man and two rod-men constitute the party. Each of the rod-men should carry a short bill-hook suspended from his belt to be used in cutting through thickets. One rod could be dispensed with, but the progress in open ground is much more rapid with two.

Instead of using stakes exclusively, it is preferable, where practicable, to mark stations on trees, fences, rocks and buildings, and to mark with paint. The measurement of distances by the stadia wires is, on broken ground, quite as accurate as ordinary chaining. And in crossing streams, marshes or other obstructions, it has great advantages; they scarcely retard progress where measurement by chain would be impracticable.—*Van Nostrand's Engineering Magazine.*



Published Every Saturday.

A. N. KELLOGG, Proprietor.

S. WRIGHT DUNNING and M. N. FORNEY, Editors.

W. H. BOARDMAN, Acting Publisher.

CONTENTS.

ILLUSTRATIONS:	Page.	GENERAL RAILROAD NEWS:	Page.
Gas-Burning Locomotive	115	Railroad Earnings in February	120
Head-Light	115	Personal	121
Glass Bearings	117	Elections and Appointments	121
CONTRIBUTIONS:		Traffic and Earnings	121
The Southern Route to the Pacific	115	Old and New Routes	121
Eastern Engineering from a Western Point of View	116	Hannibal & St. Joseph Railroad Report	124
Strength of Steam Boilers	116	Northern Central Railway Report	124
EDITORIALS:		Union Pacific Railroad Report	124
The Raid on Erie	118	MISCELLANEOUS:	
Broken Rails	119	Gradient Surveying	117
The Union Pacific	119	Railroad Patents	123
To Master Mechanics	119	Train Dispatching	123
The Texas Cattle Traffic	120		
EDITORIAL PARAGRAPHS	120		
CHICAGO RAILROAD NEWS	120		

Editorial Announcements.

Address.—The RAILROAD GAZETTE will be printed for the present in New York; our printing house in Chicago having been destroyed. All communications, therefore, whether editorial or business, should be directed to the New York office. The proprietor will receive subscriptions and advertisements at his office in Chicago, Nos. 63 and 65 South Canal street, but letters should be addressed to New York.

Correspondence.—We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Inventions.—No charge is made for publishing descriptions of what we consider important and interesting improvements in railroad machinery, rolling stock, etc.; but when engravings are necessary the inventor must supply them.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

THE RAID ON ERIE.

On the 8th inst. nine of the fifteen directors of the Erie Railway Company addressed a letter to Mr. Jay Gould, the President, in which they requested him to convene the board on Monday the 11th inst., "for the consideration of such business as may be deemed necessary." They say in this letter that they have "witnessed, with deep regret, the growing distress which pervades the community in regard to its [the company's] management," and specify as "prominent among the embarrassments," its finances "and a general want of confidence in the credit of the company." The directors signing this letter were Frederick A. Lane, Counsellor of the company; Horatio N. Otis, the Secretary; Justin D. White, the Assistant Treasurer; George C. Hall, the Purchasing Agent; O. H. P. Archer, the Vice-President; Henry Thompson, John Hilton, Homer Ramsdell and M. R. Simons: all of whom, except Mr. Archer, who was chosen in place of James Fisk, Jr., deceased, have long been members of the directory and are identified with its management of late years. The by-laws of the company require the President to call meetings at the request of a certain number of directors, and this request was in due form. No attention was paid to it by Mr. Gould, however, and on the following day (Saturday the 9th inst.), the same directors, with the exception of Mr. Archer, addressed a letter to Vice-President Archer, requesting him to call the meeting, and stating that they had been unable to communicate with the President. Mr. Archer issued a call for a meeting accordingly.

The meeting was held accordingly, and, strange to say, a captain of police with a force of more than a hundred men appeared at the same time as spectators. Besides the nine directors who signed the call there were present at the meeting two other directors, Charles G. Sisson, of Jersey City, and Gen. Alexander S. Diven, of New York. Jay Gould, Edwin Eldridge, Henry Sherwood and John Ganson either did not recognize the meeting as legal, or were not present. Mr. Gould was in his office, and he collected a posse of roughs, numbering perhaps one hundred or more, whom, in accordance with an absurd law of the State, he appointed "special policemen."

However, before any interruption was attempted, the

meeting came to order with the Vice-President in the chair, and the directors present proceeded to fill two vacancies in the board, occasioned by the resignation some time ago of William M. Tweed and O. W. Chapman. Gen. John A. Dix, late Minister to France, and W. Watts Sherman, of the banking house of Duncan, Sherman & Co. (whose partner is a director of the Atlantic & Great Western), were chosen to fill these vacancies.

Hereupon a messenger of the attorneys of Jay Gould served an injunction issued by Judge Ingraham, of the Supreme Court of New York, at the complaint of the Erie Railway Company, which complaint set forth that the nine directors who joined in the call for a meeting had entered into a conspiracy with agents for Bischoffsheim & Goldschmidt, bankers, of London, for the purpose of transferring the control of the company to this firm and the persons represented by it. It set forth that these directors were to resign one by one, and have their places filled by agents of this firm, and that the retiring directors were to be paid certain sums for such resignations, amounting in the aggregate to about \$250,000. It also set forth that the President had not received a written request to call a meeting, and charged that it was the design of the conspiracy to give control of the Erie Railway to agents of the Atlantic & Great Western, for the benefit of the latter, and not of the Erie Railway.

This complaint deserves special attention. It is easy enough to make charges, but in this case, so far, the charges have been confirmed by the events; and before an hour passed after the serving of the injunction the persons whom the complaint had termed "conspirators" had done just what it said they would do.

For no attention was paid to the injunction, on what pretense does not appear; but the session of the meeting was continued. Director Charles G. Sisson resigned, and the board filled his place by Gen. George B. McClellan, President of the Atlantic & Great Western Railroad Company; John Hilton made room for S. L. M. Barlow (of Barlow, Larocque & Macfarland), a director of the Atlantic & Great Western; Charles Day, Secretary of the Atlantic & Great Western was chosen in place of another resigning director; Col. H. G. Stebbins, W. R. Travers, F. N. Drake and H. L. Lansing were chosen successively to fill vacancies made one after the other by the resignations of Messrs. Simons, Otis, Thompson, White and Lane, leaving of the old directors Messrs. Gould, Archer, Hall, Ramsdell, Eldridge, Diven, Sherwood and Ganson.

After thus changing the directors, a resolution was passed removing Mr. Gould from the office of President, and Gen. John A. Dix was chosen to succeed him in this office. Mr. S. L. M. Barlow was chosen Counsellor in place of F. A. Lane, and W. W. Sherman was made Treasurer.

This election was not recognized by Mr. Gould, and both parties held possession of their respective rooms, making various demonstrations, until the afternoon of Tuesday, and the prospect for an extended litigation seemed excellent. But, though Gould should obtain a decision setting aside the proceedings of the meeting as void, it could not be concealed that a majority of the board was opposed to him, and nothing could prevent their doing legally what they had just done, as he claimed, illegally. Negotiations were held which ended in a compromise by which on his promise to resign the presidency and to hold the meeting regularly, everything was begun *de novo*, and, with Mr. Gould in the chair, the proceedings of the day previous were repeated, director after director resigning, and the new men being chosen in their places precisely as before, except that, after the change of the directory, Mr. Gould presented his resignation. The elections of officers were made also as on Monday, and by Tuesday night the Erie Railway Company was reorganized without charge of illegality, nine new directors having been chosen.

What do these extraordinary proceedings mean? What made them possible, and for what end were they intended? These are questions which the community should consider well before they characterize this sudden change of management as a brilliant stratagem in the interest of law and order and the rights of long-suffering stockholders. The feeling against the leaders in the late Erie management is so strong, so wide-spread among all honest men, and, more than all, so well founded, that successful measures to oust them are likely to be applauded, without any nice questioning as to the means employed or even the ultimate designs aimed at. It was and it is of the utmost importance that the owners of the Erie Railway shall be enabled to keep possession of it and to dictate its management. It was—and we fear we must say it is—a burning shame that any man or set of men should be able to seize this property and hold it, year after year, and operate it in their own interests without reference to its owners. Any legal method of putting its shareholders in control was to be welcomed.

But what have we here? Some months ago, Mr. James

McHenry, late President of the Atlantic & Great Western Railway Company, since bankrupt, and Messrs Bischoffsheim & Goldschmidt, London bankers, through whom that company, altogether in a legitimate and proper manner, so far as we know, was reorganized, issued a circular asking that English holders of Erie stock intrust them with the agency for their shares, in order that they might be enabled to carry out a plan for the reorganization of the company, which, they assured the shareholders, they certainly would be able to effect. Any prospect of changing the management was exceedingly grateful to the shareholders; but there were reasons why they should, and many of them did, hesitate to intrust their interests to the agents and representatives of the Atlantic & Great Western Railroad, a property necessarily dependent on the Erie Railroad so long as it has its present wide gauge, and enormously loaded by an excessive capital account. Moreover, a combination of English shareholders had been made long previous, whose shares were registered with Messrs. Heath & Raphael, and whose attorneys in this country, Messrs. Evarts, Southmayd & Choate, have conducted with considerable success litigation against the Erie managers, and have pushed in the Legislature bills which would soon give the shareholders the power to change the management as they please, and which were almost certain to become laws during the present week. However, a considerable number were registered with Bischoffsheim & Goldschmidt, and Monday we saw their plan executed. And what was it? Apparently nothing more nor less than the purchase of a majority of the directory; for, if we suppose that the directors who signed the call for a special meeting were actuated solely by a desire to restore the stockholders to their rights, or even to terminate what had become a public scandal and was disgracing them in the estimation of the world—which latter is not an improbable and not an improper motive—why should they wait for the mediations of George Crouch and James McHenry and Bischoffsheim & Goldschmidt, and why should they turn over the control of the property to the representatives of a small fraction of the shareholders, instead of ousting Gould and Fisk months ago, as they might have done, and making up a board representing all the directors, and not simply those represented by Bischoffsheim & Goldschmidt, who alone of all the organizations of the shareholders could be suspected of desiring to subordinate the Erie, in which their interest is small, to another property, in which their interest is very large?

It is true that some of the gentlemen chosen Monday have no interest in the Atlantic & Great Western, and would not be likely to do any dishonorable act; but these, so far as known, seem to be quite as much surprised as the rest of the world at the plan and its success, and to have, virtually, received their positions at the hands of Atlantic & Great Western agents. And it is also true that the representatives of the Atlantic & Great Western are men of character and reputation. But it is no less true that the men who have dictated the new management and who may be expected to direct it are little interested in Erie and largely interested in Atlantic & Great Western, and ought not to be put in a position where they will be able to subordinate the interests of the former to those of the latter.

That any attempt will be made to make permanent contracts between the two companies at the present time seems incredible, and we do not believe that it is intended. It is rather probable that those who planned the *coup d'état*, and who had it executed just a few days before an act of the Legislature was likely to put all difficulties out of the way of the stockholders in choosing their own representatives, intended to impress the great mass of shareholders and secure their suffrages on the day of election. The board chosen at that time will receive authority directly, and any steps they may take will doubtless be accepted as expressing the will of the shareholders. If the English proprietors, dazed at the success of Mr. McHenry's (for we believe we may call it his) brilliant trick, shall give their property in trust to him and his associates, probably the latter will secure what they have desired. But they should bear in mind that the Erie is a property of great value, and more than any railroad which has no New York terminus, is independent. It is secure of an enormous traffic, not always the most profitable, but sufficiently so to pay a very large interest on its cost (we will not say its stock). And the Atlantic & Great Western is a line whose traffic is comparatively light and unprofitable and whose debt is overwhelming. The Erie under an honest and a steady management will have little difficulty in making advantageous alliances, and the shareholders should see to it that the men whom they entrust with its management have their chief interest in its prosperity, and not in that of any other road. The present managers are not their representatives. They are really the repre-

representatives of the late board, a majority of which elected them. The shareholders may feel a sympathy with any one who has rescued their property from those who have seized it; but the operation, despite its rapidity and unexpected success, is much like that of sneak-thieves plundering the plunder of highway robbers; for the plot by which Gould and his associates lost control of the company was only less disgraceful, in its methods if not in its aims, than that by which they gained it. However, all irregularities and all the low tricks by which the management was changed will be excused and forgotten if it shall be at the earliest possible moment returned, and placed at the disposal of all the shareholders, American and foreign, whether registered with Bischoffsheim & Goldschmidt or with Heath & Raphael, or with neither; and if no attempt is made to claim suffrages, out of gratitude, for a directory whose interests are not in the Erie, but in another railroad.

BROKEN RAILS.

So many railroad accidents have recently been assigned to this cause, and yet so little discussion has been given the subject, that it seems to be regarded as final and irremediable. When a train runs off the track and a half a dozen or more passengers are killed or maimed or burned alive, if the railroad company which has suffered from such a misfortune can only show that the cause of the accident was a broken rail, the daily papers and the daily public seem to be quite satisfied that the accident could not have been prevented. Now, if the breaking of rails is surrounded by unfathomable mystery, then it certainly is time that railroad managers should study the subject, to learn what is hid, and provide the means of guarding against the evil; if, on the other hand, the danger of breaking rails can be, if not entirely eliminated, at least lessened so much that it will be no longer very formidable, then it becomes the duty of railroad officials to observe the requisite conditions, if they are of such a nature as to be practically available.

We suppose that a very large proportion of the human race quite naturally conclude, when anything breaks, that it is not strong enough to stand the strain to which it is subjected. There is, of course, another horn to the dilemma, which is, that the strain may be greater than the strength of the thing which breaks. There is no escape from these statements, and it sounds almost like frivolous nonsense to present them. The importance, however, of keeping these principles clearly in mind was forcibly illustrated when iron first began to be used in the construction of bridges. Engineers had the most exaggerated ideas of its strength, and as it would resist a tensile strain of from 40,000 to 60,000 lbs. per square inch without breaking, they subjected it in their structures to strains very little under its ultimate strength. The result was, that many of their earlier bridges broke down, and there were for a long time, and in fact until a very few years ago, multitudes of loose theories afloat, explaining that iron, on account of its inelastic character, its tendency to "crystallize," its susceptibility to electrical influences and other causes, was not a suitable material for bridge construction. There were those then who argued about bridges as persons do now about boiler explosions and the fracture of rails, that the cause is not mysterious, but is the result simply of subjecting the material to greater strains than it should bear. Fortunately, the strains on bridges are susceptible of accurate mathematical calculation, and Fairbairn by his brilliant experiments, in which he subjected beams to strains varying from their ultimate strength to less than one-fourth that amount, showed that iron subjected to strains greater than one-fourth of its ultimate strength becomes deteriorated, and if the strains be imposed often enough, fracture will ultimately, and at no very remote period, occur. Since these experiments were tried, the "inelastic," "crystalline" and "electrical" theories have gradually been losing ground, and now are very seldom heard from; and when an iron bridge breaks down now, instead of looking for mysterious theories, we inquire who was the engineer, and if we can comprehend why men with so little brains were created, we cease to wonder at the calamities sent by Providence.

Unfortunately for the safety of travelers, the strains to which rails are subjected are not so susceptible of exact mathematical computation as are those imposed on bridges, and, therefore, it is not so easy to present a clear scientific demonstration of the sufficiency of a greater factor of safety as a protection against the breakage of rails. There is nearly always apparent room for a hypothesis of the presence of phosphorus or the influence of cold. The protectionist can, if a broken rail is of English manufacture, always be sure of some hearers if he rails at the inferiority of the products of foreign manufacture. A free-trader, if the fractured bar is American, will denounce the deteriorating influence of subsidizing

one portion of the community for the benefit of another. The road-master is nearly always ready to demonstrate that, although the rail did break, it should not have done so. And yet, notwithstanding the fact that public attention can be so easily diverted from the true cause, it is nevertheless quite obvious to a thoughtful person that it is exactly the same as that which made the first iron bridges insecure. That this should be the reason is also quite natural. The earlier cars weighed only about half as much as those at present in use; and the trains were less than half as heavy. Their weight and speed has gradually increased, and have made heavier engines necessary; until now nearly all the leading roads in the country have engines running with loads of from five to six tons on each driving-wheel, instead of three and four, as was the case ten or fifteen years ago. The result is that rails weighing 56 lbs. per yard, and of a quality which made them entirely safe under the engines of that day, are quite dangerous on our roads now, although made of equally good material. The fact is, it is hardly necessary to look further for the cause of so many accidents from the fracture of rails than to the general disregard which is shown in maintaining a proper proportion between their size and the weight they must carry. It is, of course, true that a great deal of poor metal is used in their manufacture, and that most of the roads built for the benefit of the contractors alone have been laid with rails of so poor a quality as to be utterly unfit for use. Of course, a light rail of good quality is stronger than one made of poor material. The reform in securing greater strength should, of course, be pushed in both directions; but, altogether, we believe that there is more danger in the reliance which is now placed in rails which are too light than from any existing trust in an inferior quality. Every railroad man knows that brittle rails are unsafe. If they are so the fact constantly comes to the notice of those who repair the track. In handling, bending, cutting and forging, this fact constantly makes itself apparent; but if those who have the care of and authority over a track place their trust in rails which are too light, and then do—what they are sure to do when a fracture occurs—assign it to some other cause, they are putting their faith in an error, or believing a lie.

The fact that roads which are laid with heavy rails and on which the track is well kept up have very few accidents from their breakage, and that most of the casualties from this cause occur on lines which have light rails and heavy rolling stock and are in bad repair, seems to be strong evidence to indicate where the cause should be looked for.

The proportion which should be maintained between the weight of rails and the load on the driving wheels of locomotives is one which is, of course, not accurately calculable. The rule given by Rankine, that "the weight of rails, in pounds per yard—15× greatest load on a driving wheel in tons" (of 2,240 lbs.), gives results, or rather weights, for rails heavier than those generally used in this country; but probably that fact, taken in connection with this other, that accidents from rail fractures are much more frequent here than in Europe, indicates the necessity of adopting Rankine's rule.

THE UNION PACIFIC.

As was expected, the representatives of the Pennsylvania Railroad Company retired from the directory of the Union Pacific Railroad Company at the annual election on the 6th inst., when Horace F. Clark, Augustus Schell, James H. Banker and F. Gordon Dexter, of New York, took the places of J. Edgar Thomson, Thomas A. Scott, Andrew Carnegie and William Dennison in the directory; and it is supposed that the new members will dictate the management of the property, as the retiring members have done for the year past, although they are a small minority of the board, and the eleven other members are the same who served under President Scott; and the election of Horace F. Clark, President of the Lake Shore & Michigan Southern Railway Company, as President, confirms this impression.

Some have supposed that this change of management is the result of a contest in which the Vanderbilt party overcame the Scott party, and that it may be counted a defeat for the Pennsylvania managers. But there seems to be no reason for this belief. It was currently reported when Mr. Scott took the presidency of the company a year ago that he aimed to make the investments of himself and friends in the stock profitable, the Union Pacific being likely to bring just about as much traffic to the Pennsylvania Railroad under one management as another, and not likely immediately to yield a profit on its business which can be divided among the stockholders. Whatever may have been Mr. Scott's intentions, his management has resulted pretty much as above indicated. The stock rose during the year about 50 per cent., and the Pennsylvania party apparently "un-

loaded" when it had reached about the highest quotations. At least it made no sign at the election, there being but one ticket voted for and that receiving the votes of 323,885 of the 367,450 shares of stock.

The figures of the report have been given heretofore. The remarkable feature is the great economy in operation indicated. With a traffic nearly the same as the previous year (yielding \$100,000 less) the expenses were less by 23 per cent., or more than a million dollars, and were less than 48 per cent. of the gross receipts—a proportion smaller than on any other American railroad, we believe, and which seems especially remarkable on a road with so light a traffic as that of the Union Pacific; though the very high rates and the newness of the line (requiring very little expenditure for renewals) favor it.

The receipts of the road are not absolutely small, for there are a great many American railroads which earn less than the \$7,288 per mile which the Union Pacific returns; but they are very small in proportion to the capital account of \$100,000 per mile. The net earnings are \$3,600 per mile, which would pay a very fair interest on the necessary cost of the property. But the interest on the income bonds (\$1,000,000) and on the first-mortgage gold bonds (with premium on gold amounting to about \$1,800,000 currency) will leave but \$800,000, and the government then has to pay the interest of the second-mortgage bonds indorsed by it, which also amounts to \$1,800,000, and the net income of the road from traffic is thus seen to be just about \$1,000,000 less than the interest on its bonded debt.

As for the future of the road, it is not very certain. The largest part of the line is unfortunate in having scarcely any local traffic and very little prospect of any. But for a considerable distance in Nebraska the country is fertile and growing fast, and there is a healthy growth of through traffic from the Pacific coast. The completion of a rival road, however, which is probably an assured event, will deprive it of at least a portion of this through traffic, which is its chief dependence; and unless this business shall very largely increase before a new road is opened, its receipts may be less than now. This, however, is something which the Central Pacific Company is likely to control pretty much at its own pleasure. That great company controls nearly every mile of railroad in the State of California, and in case of the completion of the Northern and Texas Pacific roads, will be in position to turn by far the largest part of the traffic of the State of California to either road. As it can keep the transportation on its own road for a greater distance by bringing it to the Union Pacific, it will be likely to favor that road; but any combination which it may make with either road will probably be the making of it and a very great injury to its rivals. Its control, however, extends chiefly to eastward traffic, though there is now no prospect that either the Northern or the Texas Pacific will be able to send traffic to San Francisco, except over the Central Pacific's lines; and San Francisco, in spite of all that may be said for San Diego and Puget Sound, is and is likely to remain the New York of the Pacific coast.

To Master Mechanics.

As the time—the second Tuesday in May—for the meeting of the convention of the Master Mechanics is approaching very rapidly, it may not be amiss to call the attention of the members to the importance of having their reports sent in at the earliest practicable moment. The thing which is most necessary to make the meetings successful is that the business, the reports and discussions which are presented at them should be of such a character that those who attend may feel after the adjournment that their time, money and attention were well spent. The feeling which is quite natural with most men, but more especially with those who underestimate their own acquirements, is that what they can contribute is not important; and therefore they leave the inquiries of the committees unanswered, or, if appointed on any of them, pay very little, if any, attention to their duties. If the members go there and hear nothing which interests them; if no new ideas are presented or facts elicited, they are apt to grow lukewarm, and return home with the feeling that next year they will waste neither time, money nor patience in attending the meetings.

As only a few weeks remain, it is exceedingly desirable that each member who has received the circular of inquiries from the different committees should answer them as promptly as possible, and if any of the committees have not yet completed their reports, to do so as early as possible.

We would also suggest that reports would frequently be made much more valuable by the addition of drawings, and that if more of these were contributed, the interest of the meetings and discussions would be very much increased. Those master mechanics who keep a draftsman could very easily have drawings made of machinery which they have designed or are constructing, and sent to the

meetings. If these were framed, or otherwise arranged for exhibition, quite a picture gallery might be improvised each year, and doubtless manufacturers would be only too glad to contribute to the collection. It is not too late now to do much in this direction, for the May meeting. Drawings, of course, need not be confined to those subjects which have been solicited for discussion, but any piece of machinery which is new in plan or design—a locomotive, car, water-crane, coal-dump, apparatus for purifying water, or other piece of machinery, might be illustrated to advantage, and with much interest to all who attend the meetings. This would also give the members an opportunity of seeing good specimens of mechanical drawing, an art which is not cultivated to the extent it should be by railroad engineers. A premium for the best drawing contributed would excite a spirit of rivalry among draftsmen which would do them good, and at the same time would put into an accessible form a large amount of information.

We would urge those who have not yet prepared their reports or answered the committees, to do so at once. A few hours' extra work at night will be sufficient, and members should remember that facts are what are needed, and not fine composition or unexceptionable grammar—these latter being of very little importance in this connection. It is probable that the convention in Boston will be attended by a larger number of persons who are not members than any previous meeting, and therefore, if for no other reason, it is desirable to have a good meeting.

The Texas Cattle Traffic.

Texas cattle form a large portion of the traffic of the Kansas railroads, and each makes special efforts to secure as large a share of the trade as possible. The Kansas Pacific for a long time had no competition, and Abilene, which is due north of the leading trail across the Indian Territory, is the chief shipping station on that road. Last year the Missouri River, Fort Scott & Gulf, the Missouri, Kansas & Texas and the Leavenworth, Lawrence & Galveston all had stations directly on the border of the Territory, where they competed for this traffic, at Baxter Springs, Chetopa and Coffeyville respectively. But these places are all near the southeast corner of Kansas, and, though nearer Texas than any stations on the Kansas Pacific, are not so near the great cattle trail. The Kansas Pacific, in spite of their competition, continued to receive the greater part of the traffic. This year, however, the Atchison, Topeka & Santa Fe has completed its line past the intersection of the cattle trail, and established a shipping station at the present terminus at Newton, and it has graded and soon will have in operation a branch south to the Arkansas at Wichita, where the cattle trail crosses, and will be prepared to intercept the traffic a hundred miles south of the Kansas Pacific on the most frequented trail. This trail has recently been legalized by the Kansas Legislature, by an act which makes it a legal highway 500 feet wide from the territory line as far north, we believe, as Abilene. So long as the country was entirely unsettled, such a law was superfluous, as the drover could take the route across the prairie that pleased him, without danger of injuring any property; but settlers have taken up much of the land, and it becomes necessary to limit the route by which the cattle may be driven. Another law makes drovers responsible for all damage which their cattle may do to crops while grazing without a herder. A vast expanse of pasturage is necessary on any cattle trail, and any considerable occupation of the route by settlers will necessitate its abandonment as a general route. A dozen different routes may be practicable—that is, may furnish pasturage for the cattle—for years after the open lands on the great trail have become too limited for all the cattle. But before that time it is probable that the cattle will be shipped either as soon as they have crossed the Kansas border, or in Texas itself.

THE HANNIBAL & ST. JOSEPH RAILROAD, according to its report for the year ending with August last, made very satisfactory earnings, being at the rate of \$12,290 per mile of road, which is exceeded, we believe, by no company west of Chicago, certainly by none west of the Mississippi. But for its very large capital account of about \$70,000 per mile, it might be one of the best dividend-paying railroads in the West. But its bonded debt requires an expenditure for interest of about \$3,800 per mile, and, the net earnings being \$4,300 per mile, there is left comparatively little to divide among the holders of common stock, and the addition of \$5,000,000 to the amount is not likely to help them. Hereafter the road will have a capital of about \$90,000 per mile. A part of it is provided for by the land-grant fund, but it remains heavily burdened, and, though the business of the country through which it runs and of the roads with which it connects is sure to increase, its receipts may not grow, as competing railroads grow faster than the traffic. Only two years ago the Hannibal & St. Joseph had no rival for traffic to and from Chicago and the East from a district more than a hundred miles wide from the Mississippi to the Missouri, and it had almost a monopoly of the great traffic between Chicago and Kansas City. Now there are two other lines on which cars run through between Chicago and Kansas City; another just opened between Chicago and St. Joseph; the Burlington & Southwestern is about to provide still another—all receiving more or less local traffic, and the Missouri, Iowa & Nebraska, the Hannibal & Central Missouri, the Quincy, Missouri & Pacific, and the St. Louis, Council Bluffs & Omaha all have begun to take a share of the traffic from the vast district which so lately it had pretty much to itself. There is, it is true, no probability that it will

ever be reduced to a light traffic; but there is on the other hand a strong probability that the very large capital account, especially since the issue of \$5,000,000 of new common stock, may for a long time prevent any considerable dividends on the shares.

THE FRENCH RAILROADS, it is proposed, may be made the foundation of an immense loan by the government, which now needs to use every means possible to reduce the rate of interest. The proposition is for the government to assume the obligations and the management of the roads, paying for them with a loan made at the rate of 5½ per cent. and secured by the railroads. The obligations, which would be retired, bear an average interest of 195,000,000 francs, while the interest on the government loan would be 30,000,000 francs less; and as the roads easily earn the former amount, the government would make a clear income of 30,000,000 francs per annum by the operation. Nations usually disdain to offer any other security than their good faith for loans; but there is such a thing as straining the credit of the most prosperous and honorable of countries; and we in the United States do not have to look back far to find the time when our gold bonds brought but 40 per cent. of their face in gold; and France, which once paid but 3 per cent., now pays 5 or 6, and will hardly find it easier to raise the balance of the German indemnity if future loans are based on the national credit only. The railroads which it is proposed to mortgage cost about seven milliards, and will, it is believed, form a basis for a loan of three or four milliards, which would be readily taken at comparatively low rates.

ADVERTISING for officers is not, so far as we know, resorted to in any case by American railroad companies, though here the demand more than elsewhere is in excess of the supply, and some companies, it cannot be denied, sadly need better officers than they have. In England, however, it is not uncommon to see advertisements for locomotive superintendents, etc.; and we have before us now an advertisement in an English newspaper from Madras Railway Company, of India, for two "assistant traffic managers," who are to have salaries of £450 each, and an assistant to the Chief Auditor at £300 per year, with free passage to Madras.

It is not to be supposed that the company cannot fill these places without advertising, but it is quite possible that by advertising the company may find a large number of applicants for the places, and be able to make a better selection than it otherwise could.

THE OHIO LEGISLATURE has recently passed a law requiring railroad companies to construct fences, cattle-guards and crossings, both public and private, within one year from the 1st of April, and to keep them in repair. This the railroad companies in so populous a State as Ohio ought to have done, with or without a law, long ago. There is some excuse in a new country and on new railroads, where there are but three or four trains daily, and yet more trains than wagons likely to cross the track at any one place, for postponing fencing; but in a settled and civilized country such things should not be.

THE UNION PACIFIC removed its offices from New York to Boston because of the peculiar administration of justice in the former city, which at one time seemed likely to give the control of the company to parties who were ready to seize it. But the company has now asked for an investigation into the facts concerning the proceedings which caused its removal, and it is guessed that it will gladly return to the neighborhood of Wall street, a Vanderbilt company with its headquarters in Boston being an anomaly.

Railroad Earnings in February.

The following earnings of railroads for February have been reported:

	1872.	1871.	Increase.	Per cent.
St. Louis, Kansas City & Northern.....	\$245,010	\$192,130	\$52,880	27½
Marquette & Cincinnati.....	143,408	126,224	17,184	15½
Toledo, Peoria & Warsaw.....	100,433	71,743	28,690	40
Milwaukee & St. Paul.....	387,525	327,431	60,094	18½
Toledo, Wabash & Western.....	481,949	328,791	153,158	46
St. Louis & Iron Mountain.....	156,292	122,373	33,919	27½
Pacific of Missouri.....	238,823	219,504	19,319	8½
St. Louis, Alton & Terre Haute.....	130,889	124,812	6,076	5
Cleveland, Columbus, Cincinnati & Indianapolis.....	318,626	273,751	44,875	16½
Lake Shore & Mich. Southern.....	1,251,511	1,076,112	175,399	16½
Chicago & Alton.....	329,170	242,368	86,802	35½
Illinois Central.....	527,069	529,616	Dec. 2,546	½
	\$4,259,703	\$3,734,845	Inc. \$524,857	

This is a very satisfactory showing indeed. The increase in the aggregates is more than 12 per cent. The only two lines extending from Chicago inland which report show a very small decrease, and there is no doubt that some of their legitimate traffic has gone to swell the receipts of east and west lines which cross Illinois south of Chicago, owing to temporary disabilities at Chicago. But as soon as navigation opens there will be nothing, or very little, to prevent traffic from taking its old course, and then the Chicago roads will be likely to make as good showings as the best.

The earnings of the roads above for the months of January and February were \$3,174,997 in 1872 and \$7,183,773 in 1871, showing an increase for the current year of \$991,224, or nearly 14 per cent.

St. Clair River & Saginaw Valley.

A warm discussion is going on as to the proper route for this proposed branch of the Canada Southern from St. Clair to East Saginaw or Bay City. Port Huron desires to have it pass through it on the way, and there is a proposition to continue it up to Lake Huron from Port Huron to Lexington, 22 miles, and then turn westward, and another is to construct the line directly from St. Clair.

Chicago Railroad News.

Prospects for Grain Shipments.

The shipments of grain to Chicago by the different railroads have been unusually small during the past winter, not because there was little grain in the country, for in most of the country drained by Chicago railroads the crops were unusually large, but because there has not been room in the city to store the usual amount of grain. The destruction of several elevators by the great fire reduced the storage capacity of the city by about 6,000,000 bushels; and though shipments are possible and to a great extent are made to the East by rail, yet the great bulk of the grain waits for the cheaper transportation by lake. Every effort has been made to supply additional storage facilities by loading all the vessels which could be got at; but some time ago the city's storage capacity was virtually exhausted, and grain receipts have been small. But the warehouses at the country stations are for the most part well filled, and the farmers have large amounts in their granaries which under ordinary circumstances would be in Chicago by this time. Everything indicates that as soon as navigation opens and the city elevators are relieved there will be an extraordinary flow of grain into the city, and the chief grain roads, such as the Chicago & Northwestern (which is the great wheat road), the Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, the Chicago & Alton and the Illinois Central, will find full employment for all their rolling stock. Heretofore, it is evident the blockade at Chicago has been for the benefit of the east and west roads crossing the State south of Chicago, such as the Toledo, Wabash & Western, Toledo, Peoria & Warsaw and the Indianapolis, Bloomington & Western, which have had during the past winter an unusually large traffic, especially in grain. As through grain routes they are not only shorter for the country through which they run, but they have not had that excessive burden of more profitable traffic which has rendered the roads from Chicago eastward comparatively indifferent to the through grain traffic this winter.

Chicago & Canada Southern.

The chairman of the railroad committee of the Common Council, Mr. C. L. Woodman, has in his possession an ordinance, sent to him by the officers of the Chicago & Canada Southern Railway Company, asking the right of way into the city on a line parallel with and in close proximity to the Chicago, Rock Island & Pacific track. The ordinance proposes to grant the Chicago & Canada Southern and the Decatur & State Line roads the right of way, commencing on the south line of the city between Arnold and Butterfield streets, thence parallel with the Rock Island & Pacific track to Sixteenth street, thence north to Twelfth street between the east line of Burnside street and the east line of Fourth avenue and the South Branch; thence north to Van Buren street between the west line of Clark street and the South Branch of the Chicago River.

The company proposes to be governed by the same rules as the Rock Island & Pacific now is under in regard to cross-streets, and asks the right to sink its track within the city, if it shall so choose.

Atlantic & Pacific.

The Treasurer of the Atlantic & Pacific road has gone East to purchase railroad iron enough to lay the track between this city and Elgin. So much of the track is to be laid during the coming season. The company has decided to ask for the right of way into the city along Bloomingdale road, in the northwestern part of the city, which lies two blocks north of North avenue, until it strikes the Northwestern track; thence along the track of the Northwestern road to a point south of North avenue; thence east along Blanche street to the river, crossing which, it traverses Goose Island, striking Larabee street, in the North Division, near Chicago avenue. The track is then to pass along Kingsbury street, nearly parallel with the river, to Kinzie street, at the intersection of which streets it is proposed to locate the passenger depot. The Council Committee on Railroads will consider this subject at its next meeting. It is generally believed there will be little difficulty in getting the right of way as asked.

Chicago, Danville & Vincennes.

During the first week of this month this company purchased in this city real estate to the amount of \$600,000 for freight and passenger depots and for dock purposes. The depots will be on Halsted street, in the vicinity of Fulton street, very near the Pittsburgh, Cincinnati & St. Louis depots. The dock property is on the south side of the South Branch, in the outskirts of Bridgeport. The company will proceed to the construction of its depot and freight buildings as soon as the question of the right of way is settled. The road is doing a very satisfactory business. It was opened about the first of last December, and the receipts for the month of December were sufficient to pay the expenses of the road, the interest on the bonds and at the rate of 3 per cent. dividends on the stock of the company. Since the first day of January the company has placed four hundred new freight cars on the road, and has ordered ten new passenger cars, which will all be employed on the road within two months. The company expects to have to transport to Chicago a large amount of grain as soon as the opening of navigation allows the grain at present in the Chicago elevators to be shipped.

Chicago, Rock Island & Pacific.

This company operates the newly completed line from Des Moines to Winterset, the latter place being about 40 miles southwest of the former, and the county seat of Madison County. There is talk of extending the branch west from Winterset through the middle of the third tier of Iowa counties, about half-way between the main line of the Rock Island and the Burlington & Missouri Railroad, where there is room for a parallel line, the two roads being now for the most part as much as 30 miles apart, and the country being exceedingly fertile, almost

every acre of it cultivable, and growing very fast. The Iowa Southwestern and the Muscatine & Western have contemplated lines through the same district.

Chicago & Alton.

This company opened, on Wednesday, the 6th inst., an extension of the Jefferson City Branch of the Louisiana & Missouri River road, being the portion from Mexico to Fulton, in Missouri, a distance of 22 miles. The road is to be opened to Jefferson City early in April.

The earnings for the first week in March were \$87,212.57. The earnings for the corresponding week last year were \$77,414.93, being an increase of \$9,797.64.

John C. Gault.

Mr. John C. Gault has been offered the position of General Superintendent of the Milwaukee & St. Louis Railway, but has not accepted it. It is said that he has received a note from Thomas A. Scott, requesting him not to make any engagement until he can see Mr. Gault. The latter gentleman goes East the latter part of this week to have a conference with Mr. Scott, and it is generally believed that he will ultimately accept a position in the employ of the Pennsylvania Railroad Company.

Lake Shore & Michigan Southern.

This company has received the greater share of the large number of locomotives and cars ordered about a year since, so is in first-rate condition to do business.

Charles F. Hatch, the General Superintendent of the road, has resigned his office, and, it is rumored here, has been offered the position of General Manager of the Eastern Railroad of Massachusetts. Mr. Hatch is a young man, 36 years of age, and has won an enviable reputation as a railroad manager. He has been connected with the Michigan Southern road eight years, and since the consolidation of the Lake Shore & Michigan Southern has occupied the office of General Superintendent for three years. His resignation is very much regretted.

La Salle & Chicago.

The committee of the Common Council has amended the ordinance providing for the entrance of this road into the city, by specifying that the company shall prosecute in good faith suits to determine all legal damages suffered by property owners by reason of the laying of the track on the proposed line, who shall claim compensation within three years, and shall purchase and pay for all lots, occupied for residences by the owners, which front the proposed line of the track, the value to be determined by arbitrators when the parties cannot agree.

A further provision is that the company shall permit side-tracks to be laid from its track to any warehouse, coal-yard, lumber-yard or manufactory within 1,000 feet of the line.

Chicago & Northwestern.

On the 11th inst. this company put on an extra train on the Milwaukee Division to run to Evanston and return so as to allow business men living in that suburb to go home to dinner. It is called the Evanston "dinner train."

Sparta, Wis., has voted \$65,000, and other towns on the line of the Madison extension have voted smaller sums, to pay for the right of way.

The Snow Storm.

The snow storm which prevailed in this city on Thursday and Friday of last week did not prevent trains from running on their usual time. The storm, though severe and prolonged here, extended but a short distance south or west. Although a foot of snow fell in Chicago, the ground was hardly whitened at Aurora or 40 miles south of this city, while the same storm extended as far as St. Paul with undiminished strength.

Chicago, Burlington & Quincy.

The most important event of the week connected with the Chicago, Burlington & Quincy Railroad has been the death of Mr. L. Carper, Division Superintendent of the Burlington Branch. On March 6, Mr. Carper left Burlington on the freight train, riding, as was his custom, on the engine. When about four miles east of Dallas the train ran off the track, and the engine was precipitated down an embankment about 30 feet. The engineer and fireman saved themselves by jumping from the engine; but Mr. Carper went down with the engine and received some internal injuries, from which he died in about 30 minutes from the time of the accident.

Illinois Central.

This company reports as follows its receipts for February, 1872:

Land Department.	
Acres construction lands sold.....	1,936.09 for \$15,907 76
Acres interest fund lands sold.....	40 for 480 10
Acres free lands sold.....	280 for 2,644 00
Total sales during the month of February, 1872, 2,256.09 for \$19,031 76	
Cash collected in February, 1872.....	\$73,087 62

Estimated Earnings—Traffic Department.			
	In Illinois 707 miles.	In Iowa 403 miles.	Total 1109 miles.
Freight.....	\$302,048 00	\$10,806 00	\$312,854 00
Passengers.....	88,189 20	25,625 30	113,814 50
Mails.....	6,375 00	3,059 33	9,434 33
Other sources.....	59,625 00	1,340 67	60,965 67
Total, February, 1872.....	\$456,237 20	\$70,831 30	\$527,068 50
Total actual earnings, February, 1871.....	\$460,938 83	\$68,678 13	\$529,616 96
Decrease.....	\$4,701 63		\$2,548 46
Increase.....		\$2,153 17	

Considering the amount of the receipts, the differences are very small. The decrease on the Illinois lines being about 1 per cent., the increase on the Iowa lines about 3 per cent.; and the decrease on the total traffic less than 1/2 of 1 per cent.

Penitentiary Cars.

The Southern Prison, at Jeffersonville, Ind., has turned out the first car of its contract for fifty with the St. Louis, Vandalia, Terre Haute & Indianapolis Railroad Company.

General Railroad News.

PERSONAL.

—We regret to chronicle the death of Mr. L. Carper, long Assistant Superintendent of the Chicago, Burlington & Quincy Railroad, in charge of the Burlington Division. He met his death by an accident to a locomotive on which he was riding.

—It is reported that Alexander Mitchell, President of the Milwaukee & St. Paul Railway Company, will resign and be succeeded by Russell Sage, now the Vice-President of the company.

—Mr. John A. Wilson, Chief Engineer of the Bennett's Branch Extension of the Allegheny Valley Railroad, has removed his office from Williamsport, Pa., to No. 410 Walnut street, Philadelphia.

ELECTIONS AND APPOINTMENTS.

—The annual meeting of the Mobile & Northwestern Railroad Company was held in Mobile on the 27th ult., and the following directors were chosen: Thomas Henry, Sr., John H. Garner, W. D. Mann, Thos. W. Sims, Leroy Brewer, Gustavus Horton, George B. Preston, Lewis Scranton, Wm. H. Gardner, of Mobile; Jas. L. Alcorn, W. R. Miles, E. P. Richardson, of Mississippi; Marshall O. Roberts, New York. The board met the same evening and elected officers as follows: President, Thomas Henry, Sr.; Vice-President, W. D. Mann; Treasurer, John H. Garner; Secretary, G. Horton, Jr.; Executive Committee, L. Scranton, John H. Garner, Thomas W. Sims.

—The following directors of the Northern Central Railway Company were elected to serve for the ensuing year, on the 22d ult.: J. D. Cameron, W. Morris, J. M. Kennedy, E. C. Biddle, Edward Smith, J. P. Jones, A. E. Kapp, Wm. Calder, Henry Welsh, George Small, B. F. Newcomer and S. M. Shoemaker. Subsequently a meeting of the directors was held, and Mr. Cameron was re-elected President of the road, and Thomas A. Scott was elected a director to fill the vacancy in the board.

—On the 5th inst. the new board of the Pittsburgh, Cincinnati & St. Louis Railway Company organized by re-electing the following officers: Thomas A. Scott, President; Wm. Thaw, Vice-President; W. H. Barnes, Secretary; M. J. Spencer, Treasurer.

—William H. Anderson has been chosen Treasurer of the Portland & Ogdensburg Railroad Company, vice H. N. Jose, resigned.

—Col. D. N. Welch, who since last October has been an Assistant Superintendent of the Pullman Palace Car Company, has been appointed General Superintendent of that company, to succeed Marvin Hughitt, who has accepted the position of General Superintendent of the Chicago & Northwestern Railway.

—Hon. John Evans, the earliest promoter and the President from the beginning of the Denver Pacific Railroad Company, has resigned; and Robert E. Carr, President of the Kansas Pacific, has been appointed in his place.

—F. N. Finney, Chief Engineer of the Canada Southern Railway, has been appointed to the same position on the Michigan Midland and the St. Clair & Saginaw.

—A. M. Methany, of Lima, O., has been appointed Master of Transportation of the Dayton & Michigan Railroad.

—Governor Palmer, of Illinois, has appointed under the law of April, 1869, Hiram Rutherford, Robert N. Patriot and Malden Jones directors of the Paris & Decatur Railroad Company.

—At the annual election of the Pennsylvania Railroad Company, held in Philadelphia on the 4th inst., the following were re-elected directors for the ensuing year: J. Edgar Thomson, Josiah Bacon, Wistar Morris, Washington Butcher, Edward C. Knight, Samuel T. Bodine, John M. Kennedy, Joseph B. Myers, John Rice, of Philadelphia, and George Black, of Pittsburgh. The city of Philadelphia chooses three members of the board, and the board four, which latter are the four vice-presidents.

—A circular dated February 28, from J. H. Gardner, General Manager of the Jacksonville, Pensacola & Mobile Railroad, announces the following appointments on that road, which took effect March 1: Henry Magee to be Assistant Superintendent of the First Division (Jacksonville to Ellaville, 95 miles), with headquarters at Jacksonville; M. F. Papy to be Assistant Superintendent of the Second Division (Ellaville to Chattahoochee, 114 miles), with headquarters at Tallahassee.

—The following have been chosen directors of the Leavenworth, Oskaloosa & Santa Fe Railroad Company: C. K. Holiday, D. L. Lakin, T. H. Walker and Jacob Safford, of Topeka; G. W. Hogeboom, Wm. A. Coy and Henry Buckmaster, of Oskaloosa; H. Foote, John Conover, M. J. Parrott, Samuel Cochran, M. Hoffman, S. N. Latta, E. Stillings, Simon Ables, John McKee and D. W. Houston, of Leavenworth.

—The third annual meeting of the Vicksburg & Nashville Railroad Company (late the Grenada, Houston & Eastern), was held at Pittsboro', Calhoun County, Miss., on the 1st inst., when the following directors were elected to serve for the current year: Gen. W. F. Tucker, S. Myers, J. Bretney, J. T. Griffin and T. W. Martin, of Chickasaw; T. T. Enoch, A. Woodward, D. C. Dulaney and M. M. Boland, of Calhoun, and L. C. Lee, A. P. Dunaway, H. B. Sherman and J. D. Leflore, of Grenada County. The directors elected the following officers: President, W. F. Tucker; Vice President, Major T. T. Enoch; Secretary and Treasurer, D. P. Black; Attorney, Hon. T. Martin.

—The Vicksburg, Canton & Yazoo City Railroad Company organized on the 10th ult. by the choice of the following directors: A. M. Paxton, President; H. C. Wal-

ker, W. B. McMeekin, A. Warner, N. H. Harris, J. R. Holloman, J. M. Stone, J. J. Cowan, W. A. Fairchild, W. B. Pittman and Warren Cowan, directors. P. F. Whitehead was elected Secretary; J. J. Cowan, Treasurer; and Jas. M. Searles, Chief Engineer. A. M. Paxton, J. M. Stone and Warren Cowan were appointed Executive Committee.

—At the annual meeting of the Missouri Central Railroad Company on the 4th inst., the following gentlemen were elected directors for the ensuing year: Levi Parsons, Francis Skiddy, Sheppard Gandy, New York; Robert S. Stevens, A. D. Jaynes, J. R. Barrett, Sedalia, Mo.; Amos W. Maupin, Union; B. R. Bonner, Lee R. Shryock, George M. Edgerton, Wm. Nichols, St. Louis, Mo. Several of these are directors of the Missouri, Kansas & Texas Company, which is to build the road as a St. Louis outlet.

TRAFFIC AND EARNINGS.

—The earnings of the St. Louis, Kansas City & Northern Railway (late North Missouri) for the first week of March were: 1872, \$62,582; 1871, \$46,000; increase, \$16,582, or 36 per cent.

—The earnings of the Burlington, Cedar Rapids & Minnesota Railroad for the month of February were \$64,475.59.

—The traffic receipts of the Grand Trunk of Canada for the week ending February 17 amounted to £33,700, against £31,500 in the corresponding week of last year, showing an increase of £2,200, or 7 per cent.

—The traffic receipts of the Great Western of Canada for the week ending February 16 amounted to £17,956, against £17,867 in the corresponding week of last year; increase, £89, or 1/2 of 1 per cent.

—The earnings of the Pacific Railroad of Missouri for the year ending February 29 were: 1872, \$3,628,944; 1871, \$3,491,191; increase, \$137,753, or about 4 per cent. The gross earnings are at the rate of about \$10,000 per mile.

—The earnings of the Toledo, Wabash & Western Railway for the first week of March were: 1872, \$107,657.33; 1871, \$84,471.45; increase, \$23,185.88, or 27 1/2 per cent.

—The earnings of the Indianapolis, Bloomington & Western Railway for the third week of February were \$29,498.41.

—The earnings of the Chicago & Alton Railroad for the first week of March were: 1872, \$87,212.57; 1871, \$77,414.93; increase, \$9,797.64, or 12 1/2 per cent.

OLD AND NEW ROADS.

Suncook Valley.

It is proposed to extend this New Hampshire railroad from Pittsfield northward through Barnstead and Gilmanton Iron Works, to Alton Bay, on Lake Winnepiscogee, about 15 miles.

Vicksburg & Brunswick.

Work is progressing on the extension of this road, and trains are now running on it from Eufaula, Ala., to a point some distance west of Clayton, Barbour County.

Railroad Legislation in Maine.

The correspondent of the Boston Advertiser gives the following summary of the railroad legislation transacted at the session of the Maine Legislature which closed on the 29th ult.:

"The following roads have been chartered:

"Lewiston & Auburn Railroad, from Lewiston to connect with the Grand Trunk near Danville Junction. The granting of this charter met with violent opposition from the Maine Central, which claimed that the business of that section was already sufficiently accommodated by their line; but the cities of Auburn and Lewiston, representing a population of 23,000, and a valuation of \$12,000,000, asked for better facilities for business intercourse with the West. The company has already been organized and the road will be built.

"The Cumberland County Railroad Company, with a charter to build a road from Gorham to Danville.

"The Sandy River Railroad Company, with a charter to build a road from Farmington to the hilly country of Phillips, in the same county—Franklin.

"The Portland, Saco & Portsmouth Railroad Company, authorized to construct a road from Kittery to Biddeford, shortening the distance between those two places 13 miles. By the provisions of the charter, however, the road is to continue to operate its present line also.

"Piscataquis Central Railroad Company, from Dexter to Brownville, running through Dover and Sebec, and thence to Brownville village. At Sebec village there is a good water power, woolen factory, lumber mills and lumber in abundance. Immense slate quarries are operating at Brownville, and an inexhaustible supply remains to be opened, all waiting for the building of this road. The Katahdin Iron Works are but a few miles farther on. The granting of this charter met with serious opposition from Bangor and those interested in the Bangor & Piscataquis road. The new road will bring the Piscataquis market region about thirty miles nearer Boston, which seems to be the great ultimatum.

"The Castine & Ellsworth Railroad Company, to be constructed from some point in the town of Castine, extending northeasterly from said town through either of the towns of Penobscot, Brooksville, Bluehill and Surry, to Ellsworth, and thence easterly to the east line of the State.

"The Penobscot Central Railroad Company, with authority to construct a line from Bangor, running northerly or northwesterly through Hermon and Levant, or Glenburn, Kenduskeag, Corinth, Charlestown and Atkinson, to the Bangor & Piscataquis Railroad at East Dover.

"The York County Central Railroad Company, for

the building of a railroad from Saco or Biddeford through Lyman, Dayton and Waterborough, to some point in Limerick or Parsonsfield.

"The St. Croix Shore Line Railroad Company, to construct a line extending from the city of Calais through Robbinston and Perry, to Pembroke.

"The Bangor & Calais Shore Line Railroad Company, with authority to build a line from Bangor, connecting with some road in that city to Ellsworth, in Hancock County.

"The Riverside Railroad Company, for the construction of a road from Skowhegan village along or by the way of the Kennebec River, in Somerset County, to some point on the Somerset Railroad (not yet built) in the town of Norridgewock.

"The Norway Branch Railroad Company, to extend a line from the village of Norway, thence to South Paris, connecting at that point with the Grand Trunk Railroad.

"The Kennebec & Wiscasset Railroad Company has been authorized to extend its road from Whitefield by the way of Pittsfield, Hartland and St. Albans, to some convenient point on the Bangor & Piscataquis Railroad, and also to extend its road from Whitefield to the north-easterly line of Montville.

"A glance at the above will give an idea of the immense railroad influence that has been brought to bear upon legislation the past winter. That all the lines will be built no one believes. Along with the above, various towns and cities through which roads pass were allowed to loan their credit to these enterprises. The general railroad bill was defeated because it put too much power into the hands of three weak, fallible men. The loan bill, allowing the Maine Central to issue bonds on the strength of their main line and its leased connections, met with violent opposition. Its passage has put the road on a good financial basis."

Lee & Hudson.

A town meeting of Stockbridge, Mass., has voted a subscription of \$40,000 to the stock of this company by a majority of 197 to 52.

Missouri, Kansas & Texas.

It has been proposed in Kansas City to give this company the Kansas City & Memphis Railroad (partly graded, but in an unhealthy condition) from Kansas City south by east to a junction with the Sedalia Division some 30 miles northeast of Fort Scott, thus giving it an outlet to Kansas City by a tolerably short line for all its Kansas roads and line across Indian Territory.

Leavenworth, Oskaloosa & Topeka.

This new company asks Leavenworth County for a large subscription for its proposed line from Leavenworth west by south to Topeka, about 50 miles, dividing the distance between the Leavenworth Branch of the Kansas Pacific and the Atchison, Topeka & Santa Fe.

Shenango & Allegheny.

This railroad is now open from its junction with the Erie & Pittsburgh at Greenville (85 miles north of Pittsburgh) southeastward 21 miles to Pardoe, 21 miles.

Mississippi Valley & Western.

The Alexandria (Mo.) Commercial says that the Chicago, Burlington & Quincy Company has made a contract to complete this road, which will form a line along the west bank of the Mississippi from Keokuk to West Quincy, and will complete a river line from Burlington to Louisiana, Mo. Allies of the Chicago, Burlington & Quincy will soon have a river line from Clinton, Iowa, north to La Crosse, Minn., and it is quite possible that within a year there will be a river line all the way from St. Louis to St. Paul and the Northern Pacific.

North Louisiana & Texas.

A bill has passed the Louisiana Senate releasing the State's second mortgage on this road for \$1,122,000, and accepting therefor capital stock to the same amount. This is intended to secure the extension of the road from its present terminus at Monroe west to Shreveport, completing a line across North Louisiana from Vicksburg to the eastern terminus of the Southern Pacific.

Missouri, Iowa & Nebraska.

The grading is nearly completed to the North Missouri, at Glenwood, and the road will soon be in operation to that point.

Burlington & Southwestern.

Work is progressing on the branch of this road which is to extend from Unionville, Mo., south through Linneus.

New York & New Haven.

This company, it is reported, has closed a contract for the construction of a double track from New Rochelle to the Harlem River, to be completed by April.

Leavenworth, Lawrence & Galveston.

This company is to run a trail from a point about thirty miles north of the crossing of the "Red Fork of the Arkansas River," on the Chisholm trail, to the bend of the Arkansas, near the mouth of Salt Fork, where the trail will cross the Arkansas River; thence through the Osage territory to Coffeyville. From the point where this trail leaves the Chisholm trail to Coffeyville the distance is about 100 miles, through a country free from timber, with abundance of buffalo grass, well watered, and having but one stream to cross. The company has made arrangements with the Osages by which they agree to make no tax on cattle driven through their country.

Belleville & O'Fallon.

This short line in St. Clair County, Ill., extending from Belleville northward to the Ohio & Mississippi Railroad, will, it is reported, be completed early next May.

Pennsylvania Railroad.

Mr. Thomas T. Firth, the Treasurer of the company, makes the following announcement to the stockholders:

"Notice is hereby given to the stockholders, that they will have the privilege of subscribing to the stock of this company in the proportion of thirty per cent. of the num-

ber of shares registered in their names February 20, 1872. Those entitled to a fraction of a share can subscribe to a full share. All subscriptions must be made between May 1 and 28, 1872, and no subscription will be received after that date.

"The following are the dates of payment:

"First installment of 25 per cent. between May 1 and 28, 1872.

"Second installment of 25 per cent. between November 1 and 28, 1872.

"Third installment of 25 per cent. between May 1 and 28, 1873.

"Fourth installment of 25 per cent. between November 1 and 28, 1873.

"The privilege of taking new stock can be sold by any shareholder. Bank allotments can be had at this office. The new stock can be paid for in full at time of subscription, if desired."

There has been some newspaper comment on this issue of new stock as a "watering" process; but there is no similarity between this issue and what is usually called "watered" stock, as stockholders obtain it only by paying its full par value, and the addition to capital is made for the purpose of adding to the capacity of the road by permanent improvements, and is entirely legitimate.

The Pennsylvania Railroad Company announce through Mr. S. B. Kingston, General Freight Agent, that a reduction will be made on the freight between Philadelphia and New York, as follows:

	Old Price.	New Price.
First-class, per 100 pounds, from.....	62	to 30
Second-class, per 100 pounds, from.....	30	to 25
Third-class, per 100 pounds, from.....	25	to 20
Fourth-class, per 100 pounds, from.....	20	to 15

Western Maryland.

Passenger trains on this road have commenced running to Smithsburg. Trains will in the future run daily between that place and Baltimore.

Perdido Railroad.

This is a short railroad in West Florida from Perdido Bay eastward toward Pensacola. The Pensacola Express reports that arrangements have been made with a Chicago firm for the extension of the line from its present terminus on Little Bayou to the bay, and the construction of mills on the bay which will saw 30,000,000 feet of lumber annually. The road was constructed solely for lumber and timber traffic.

Lowell & Andover.

The stock in this proposed Massachusetts railroad is being rapidly taken up. About \$70,000 have been subscribed since the passage of the general railroad bill.

Farmington Valley.

The subscriptions to the stock of this new Massachusetts company amount to \$32,000, there being \$50,000 wanted; and the managers are confident of success.

Atchison & Enfield.

Thirty-two shares of this company, which were subscribed by the town of Prescott, Mass., but not taken, were sold at auction in Greenwich a few days ago for five dollars a share.

Atchison & Nebraska.

A contract was let on the 2d inst. to John Fitzgerald & Co., of Plattsmouth, Neb., for the grading and masonry of the Atchison & Nebraska Railroad from its present terminus at Sterling, Neb., to Lincoln, the capital of that State, a distance of 35 miles. The work is to be completed by the 20th of June next, and the contractors are to keep out of the way of the track-layers after the 1st of June. The cars are to be running to Lincoln by the 4th of July.

Atchison, Topeka & Santa Fe.

The contractors for putting down the track between Atchison and Topeka have commenced work. The grading on this line was completed last fall. The iron necessary for it is on the ground, and within forty days, if the weather holds good, the cars will be running.

Springfield Continental Car Company.

A certificate of organization of this company was filed with the Secretary of State of Illinois on the 2d inst. The following are the directors for the ensuing year: C. A. Beecher, C. W. Matheny, Geo. N. Black, Geo. M. Brinkerhoff and Frank W. Tracy. The object of the company is to manufacture, sell and lease railroad cars.

Cincinnati Stock Yards.

The United Railroad Stock Yard Company have purchased sixty acres of ground inside the corporate limits of the city of Cincinnati, about half a mile north of the Brighton House, and work to build the new yards will be commenced at once. It is expected to accommodate at one time ten thousand cattle, twenty thousand hogs and six thousand sheep. Convenient stables will also be erected for horses and mules. Contracts with all the railroads entering the city have been made to extend their tracks to the new yards.

Northern & Southern West Virginia.

It is reported that the managers of the Pennsylvania Railroad Company agree to construct this railroad if the counties along the line will subscribe a million dollars toward it.

Sioux City & St. Paul.

There is talk of a branch of this road to extend from Worthington, a few miles north of the Iowa line, westward to the Dakota line at Sioux Falls, and, eventually, to the Missouri River.

Wisconsin Valley.

This company, it is reported, is now ready to begin the grading of its road from Tomah northeast to Grand Rapids as soon as the weather will permit.

Mineral Point Railroad.

This company expects to push two branches of an extension northward this season.

Proposed Restriction of Freight Rates in Iowa.

A bill has been introduced into the Iowa Legislature providing maximum rates for transporting freight on the railroads of that State. The following summary of its provisions we take from the Burlington Hawkeye:

"For transportation of wheat per car load of ten tons,

to be loaded and unloaded at expense of shipper, ten dollars per car load for any distance under 20 miles; 20 and under 30 miles, five cents per ton per mile; 30 and under 50, four cents; 50 and 75, three cents; 75 miles and under 100, two and three-fourths cents; 100 miles and under 150, two and one-half cents; 150 miles and under 200, two and one-quarter cents; 200 miles and under 275, two cents; over 275 miles, one and four-fifths cents per mile. All other grains ten per cent. less per ton and per mile.

"Cattle, hogs and other live stock, except horses, mules and sheep, the same price per car and per ton per mile as is allowed for wheat.

"For horses and mules per car load ten per cent. more than for cattle, and for sheep eighty per cent. of the charge for cattle. For wagons and agricultural implements, the same price as that for horses. Flour, by car load, 220 lbs. per barrel; and salt, seventy barrels to the car load, the same charge as wheat. Coal and soft lumber, including lath and shingles, one-fifth less than the charge for wheat—shingles reckoned one-tenth and lath one-sixth the rate of lumber per M.

"Merchandise according to the usual classification per hundred pounds; fourth class, double the price of wheat; third class, fifteen per cent. more than fourth class; second class, thirty per cent. over fourth; first class, fifty per cent. over fourth. One and a half first class, fifty per cent. more, and for double first class, one hundred per cent. more than first class, one hundred pounds being reckoned one two-hundredth part of a car load.

"Sec. 9 fixes the classification of freights as already established by the railroads from January 1, 1872, and declares it unlawful to make any change in avoidance of the act.

"All connecting railroads operated by the same company are to be regarded as one road, in computing distances and determining rates.

"Penalties are provided against officers and the companies for violation of the law, and it is finally declared that its provisions shall not apply to any railroad until its earnings for the preceding calendar year shall equal or exceed the sum of four thousand dollars per mile for every mile in operation during the whole of such calendar year."

Quebec & Gosford.

At the annual meeting held at Quebec on the 6th of February, it was stated the lease to Mr. J. H. Hulbert was working satisfactorily. The road was not in operation during the winter months, owing to a scarcity of traffic; the following gentlemen were elected directors for the ensuing year: Messrs. M. W. Baby, E. Chinic, N. Germain, J. D. Brousseau, J. B. Renaud, E. Lemieux and John Lemesurier.

Hamilton & Lake Erie.

The contract for the first 15 miles of the Hamilton & Lake Erie Railway, being the distance between Hamilton and Caledonia, has been let to Mr. E. W. Plunkett. This section is to be finished on or before the 15th August next.

Canadian Railroads.

The government of Ontario, Canada, has brought down orders in council granting aid to a number of lines, as follows:

Toronto & Nipissing—Uxbridge to Portage Road.....	33 1/2	\$2,000	\$67,000
Portage Road to Cobocok.....	12 1/2	3,000	37,500
Montreal & Ottawa City—Province Line to Ottawa.....	66	2,000	132,000
Wellington, Grey & Bruce—Harriston to Southampton.....	53 1/2	2,000	107,000
Hamilton & Lake Erie—Hamilton to Jarvis.....	32	2,000	64,000
Kingston & Pembroke—Twenty miles north of Kingston.....	20	2,000	40,000
Next fifteen miles.....	15	2,650	39,750
Further portion.....	93	3,250	302,250
Do do.....	7	2,650	18,550
Do do.....	16
Canada Central, Sand Point and Pembroke.....	45	2,650	119,250
Toronto, Grey & Bruce—Orangeville and Hamilton.....	47	2,000	94,000
Orangeville & Owen Sound.....	68	2,000	136,000
Midland—Beaverton & Orillia.....	23	2,000	46,000
Toronto, Simcoe & Muskoka, Orillia and Washago.....	12	4,000	48,000
Grand Junction—Belleville and Lindsay.....	85	2,000	170,000
Total.....	629 1/2		\$1,431,900
Less.....	16		
To be aided.....	613 1/2		
LINES ALREADY AIDED.			
North Grey.....	21	\$2,000	\$42,000
Toronto, Simcoe & Muskoka.....	22	2,000	44,000
Grand total.....			\$1,507,900

Danville, Hazelton & Wilkesbarre.

This railroad, extending from Sunbury, Pa., eastward to Hazelton, 47 miles, where it connects with a branch of the Lehigh Valley, has been leased for 33 years to the Pennsylvania Railroad Company, which also is a large stockholder in the company. The road has recently been completed, and seems a natural part of the Lehigh Valley system, but is also a direct outlet for anthracite moving westward over the Pennsylvania or Philadelphia & Erie.

Huntingdon & Broad Top.

The annual report of the company for 1871 shows the following facts:

Receipts from all sources, principally from coal, merchandise, ore and passengers, \$301,323, being \$127,733 in excess of expenses, and an increase in net earnings over those of 1870 of \$6,751, notwithstanding there was a strike among the coal mines in the heart of the season that lasted nearly sixty days. The expenses of 1871 were 57 60-100 per cent. of the gross receipts, which is a small fraction less than in 1870. All the items enumerated in the traffic of the company show an increase, and in pig metal and other ores the tonnage is nearly double that of 1870. The net balance of receipts over expenses on the year's business (after deducting drawback, taxes and office and incidental expenses) is \$89,449, that sum being applicable to interest on the bonded debt, which

amounts to \$2,035,500. It is a matter of complaint in the report that the Pennsylvania Railroad Company does not furnish anything like an adequate supply of coal cars, and until it does, it says, "the business of all its coal tributaries will be repressed and limited to a small annual increase." The Huntingdon & Broad Top connects with the Pennsylvania at Huntingdon, and extends southward 45 miles to Mount Dallas, where it connects with the Bedford & Bridgeport road, now under lease, extending to the Maryland State line, 31 miles, and thence by the Cumberland & Pennsylvania Railroad from the State line to Cumberland, 7 miles—whole length of road from Huntingdon to Cumberland, 83 miles. At Bridgeport connection is also made with the Pittsburgh & Connellsville Railroad, affording outlet to both Pittsburgh & Baltimore, and opens a new route to coal from the Cumberland coal mines.

Texas & Southern Pacific.

The Senate Committee on Pacific Railroads has agreed to report a bill concerning the Texas Pacific Railroad introduced by Senator Scott. The bill provides that power be given the company to issue the construction and land bonds authorized by the eleventh section of the bill, in such amounts as may be deemed needful for the construction and equipment of the road, and include in the mortgages securing the construction bonds all or any portion of the lands granted to the road. A provision is made that the amount of land bonds shall not exceed two and a half dollars per acre for all lands covered by mortgages. The construction of the road is to commence at Marshall, Texas, and shall proceed westward, the first two hundred miles being required to be finished within two years, and the entire road completed to San Diego, California, within ten years from the passage of the act. The bill also provides that the name of the road shall be changed to the Texas & Southern Pacific Railroad.

Central Pacific.

The bill introduced into Congress gives the use of Goat Island in San Francisco Bay to this company for docks and depots. The island is necessary for the defense of the bay, and the Government retains a portion of it for fortifications and the control of the whole, and in case of necessity would destroy any structures on it which might be in the way of an effective defense. The Grand Trunk Company holds grounds on similar terms on the Fort Gratiot reservation, at the foot of Lake Huron. The San Francisco Chamber of Commerce protests against the provisions of the bill, probably because they would tend to divert the business of transshipping teas and other merchandise from the Pacific from the present docks and warehouses.

In the House a motion to lay the bill on the table was defeated, but it was then referred back to the Committee on Pacific Railroads, with liberty so to amend it as to provide that within one month after the passage of the bill the President of the United States shall appoint three commissioners, who shall be authorized, at the expense of the Central Pacific Railroad Company, to hear the proofs and allegations of all parties interested in the subject matter of the bill, and who shall, within three months after their appointment, award such sum for the use of such half of the island as is granted by the bill as they shall deem just and equitable, and which award shall be paid by the Central Pacific Railroad Company before it shall avail itself of the grant.

Lake Erie & Louisville.

It is reported that an arrangement has been made between this company and the Cincinnati, Hamilton & Dayton, whereby the latter will use the part of the former north of Lima (when completed to that point) as a part of a route between Cincinnati and Sandusky, and the Lake Erie & Louisville will be enabled to run the trains from the southern part of its line into Toledo.

Leavenworth Bridge.

The last span is in place and it is promised that the bridge shall be open for the passage of trains by the 20th inst.

New York & Chicago Air Line.

This company filed articles of association in Indiana on the 5th inst. The line in that State commences in Lake County and passes eastward through the counties of Porter, La Porte, Stark, St. Joseph, Marshall, Elkhart, Kosciusko, Noble, Allen and De Kalb to the dividing line between Indiana and Ohio. The length of the road in Indiana is about 160 miles. Directors, A. Taylor, T. Snell, J. Aiken, J. C. Prescott, J. T. Snell and L. A. Hall, most of whom are leading western contractors. The capital stock is fixed at \$4,000,000, and it is reported that \$70,000 has been subscribed and that work will begin without delay.

Chesapeake & Cincinnati.

This company proposes to construct a line from Huntingdon, the western terminus of the Chesapeake & Ohio Railroad, westward up the north bank of the Ohio River to Cincinnati. The Chief Engineer, W. H. Pryor, has made an experimental survey and finds a practicable route 150 miles long, with easy curves and a maximum grade of 15 feet to the mile, whose estimated cost for road-bed is \$13,363.50 per mile. Such a road would be exactly parallel with the Kentucky & Great Eastern and separated from it only by the Ohio River.

Michigan Midland.

At a recent meeting in Grand Rapids, Col. Kitton, the President of the company, said that from the St. Clair River to the east line of Clinton County, about \$185,000 in stock subscriptions and bonuses, and the right of way, had already been secured; that Grand Haven, which had been definitely selected as the terminus, had pledged \$50,000 and the right of way; that the whole line, nearly 200 miles in length, was under contract, and would be built as fast as men and money could do it, as soon as the necessary \$3,000 per mile and right of way were pledged; that from St. Clair to Grand Rapids a line has been found with one tangent in it 32½ miles long with a maximum grade of only eight feet; that from Fentonville to the Kent County line a route had been surveyed that did not vary a half mile from a straight east and west line, with a

grade that positively does not exceed 26 feet to the mile, and with tangents in it from 10 to nearly 20 miles long; and that arrangements have been made guaranteeing the construction of the Midland to the junction with the Peninsula, just north of Lansing, within one year. A committee was finally appointed to canvass the city of Grand Rapids and see what amount of aid could be subscribed as a bonus to the company. The Lansing Republican says that city has not subscribed a dollar to the Midland, and will not unless it touches that city.

Milwaukee, Manitowoc & Green Bay.

There is a report current that the Chicago & Northwestern Company has purchased this railroad, which is now in course of construction along the lake shore north of Milwaukee. It would form virtually a northern extension of its Chicago & Milwaukee line, and could be operated by it entirely in harmony with the rest of its system.

Rock Island Bridge.

The old bridge, which was the first completed over the Mississippi, is to be removed after the completion of the new one, and the material used for smaller bridges in Iowa. It has been standing about five years, and the timbers, which were burnitized, are reported as good as new. The construction of a trestle-work from the railroad bridge across the slough to the new bridge across the main channel has been commenced. It will be used only for the dirt train carrying earth for an embankment. The distance is about 2,500 feet.

Chicago, Dubuque & Minnesota.

The contract for grading ten miles of the Turkey River Branch of this road, from its junction with the main line westward, was let on the 6th instant to John D. Bush and Thomas Kavanaugh. Five miles beyond this section, extending to Elkport, was let to farmers along the line during the winter, and they have been at work on it for some time.

Junction City & Fort Kearney.

Kansas papers say that the Kansas Pacific will construct this road as a branch of its main line, and Junction City and the county in which it is situated are to vote on the 2d of April on a proposition to give the company \$100,000 in order to secure its principal repair shops.

Panama Railroad.

There have been recently heavy sales of the stock of this company, which, it is reported, the Pacific Mail Company is trying to control.

Cleveland, Mount Vernon & Delaware.

The track on this road is now laid to a point 10 miles east of Mount Vernon, O.

Springfield & Illinois Southeastern.

The last rail in the gap between Altamont and Panama was laid on the 9th inst., and the company has now a continuous line from the Ohio River at Shawneetown northwest through Edgewood, Panama and Springfield to Beardstown, on the Illinois River, a distance of 226 miles.

Denver & Boulder Valley.

This company's road is in operation from its junction with the Denver Pacific two miles north of Denver westward 32 miles to Erie. It is operated by the Denver Pacific.

Lehigh Valley.

This company has obtained a charter for the "Bound Brook & Easton Railroad," which will extend from the eastern terminus of the Lehigh Valley to a junction with the New Jersey West Line road (also controlled by the Lehigh Valley) at Bound Brook, about 40 miles. A bill has been reported favorably for a consolidation of the Perth Amboy & Bound Brook with the above, completing a line from Easton to the Lehigh Valley's coal wharves at Perth Amboy.

Hannibal & St. Joseph.

The trustees of the land bonds advertise that they will receive proposals for the sale to them of \$50,000 of the land bonds, in accordance with the provisions of the mortgage. Proposals may be addressed to Ward, Campbell & Co., No. 56 Wall street, New York, or to the trustees, care of R. S. Watson, Boston, until noon of the 20th inst., and will be opened the following day and the awards made.

This company gives notice that it will sell on the 20th inst. 10,000 shares of the new issue of 50,000 shares of common stock at the first session of the Stock Exchange.

Canada Southern.

The Detroit Tribune reports that there are 1,200 men now at work on the Canada Southern. The whole river bank for nearly a mile opposite to St. Clair is lined with timber for the railroad dock, which is to be double the size first contemplated. All the bridging on the St. Clair Branch is now completed, except the bridge over Bear Creek, some eight miles east from the river bank, which will be completed in a few days. The Toledo papers give out that the officers of the road are looking toward that city as a possible terminus. The large bridge across Kettle Creek, near St. Thomas, Ont., is now completed. It is 1,365 feet in length, and at one point is 92 feet high.

Jackson, Lansing & Saginaw.

It is reported that by July the track on the extension of this road will be laid as far north as Higgin's Lake, in town 24 north, of range 3 west, and the design is to complete the road to the center of Osage County during the present year, the contracts to build it to that point being all let, and the work thereon well under way at several points along the line. This will take the road to the north line of town 30 north, of range 3 west, about 30 miles nearly due west from Alpena, and within 48 miles of the Straits of Mackinaw.

Grand Rapids, Rockford & Greenville.

This Michigan road is now graded to within three miles of Greenville, and the bridges constructed. On the remaining three miles the right of way has been secured,

and that portion will soon be completed. It is claimed that the road will be built and ironed by July.

Railroad Patents.

During the week ending February 20, the following patents were granted by the United States Patent Office: Railroad car-ventilator, to William G. Creamer, Brooklyn, N. Y. He claims the insertion of elastic substances around the pivots and in the bearings of automatic ventilators, to render the movement of the deflectors noiseless.

Coupling for steam or air-brakes, to Samuel N. Goodale, St. Louis, Mo.

Car-window, to William McCaull, Philadelphia, Pa.

Car-brake, to George H. Reynolds, Parsons, Kan.

Registering steam-gauge, to Edward H. Ashcroft, Boston, Mass., who claims in combination with a steam-gauge a supplementary steam-chamber and pressure-spring, actuating a registering index by means of a suitable pawl and ratchet-wheel, for indicating each time the pressure has been allowed to exceed a certain limit; the whole being so arranged that, while the ordinary range of pressure is constantly indicated in the usual manner, the said supplementary steam-chamber, with its dependent mechanism, is called into action for registering extraordinary pressures.

Car-axle lubricator, to Walter P. Burrow, Norfolk, Va.

Adjusting car-wheels upon axles, to John Kaiser, Wilmington, Del.

Adjustable car-wheel to George G. Lobdell, Wilmington, Del.

Link-guide for coupling cars, to Nathan L. Post, East Clinton, Ohio.

The following patents were granted, during the week ending February 27:

Method of manufacturing steel-capped rails, to Jonathan L. Booth, Rochester, N. Y. He claims: the method of manufacturing steel-capped railroad rails—that is to say, making the cap with thinned edges, and bending the same around the head of the rail by passing said rail and cap, superimposed one upon the other, through properly grooved rolls, the effects of which shall be to first curl the thinned edges of the caps under and against the rail, and afterward to compress the thick portion of the cap upon and around the head of the rail, as described.

Elevated track of wire or rope, to Alonzo F. Havens, Brooklyn, N. Y.

Car-spring, to Albert H. King, Rahway, N. J.

Roll for utilizing the fag-ends of railroad rails, to Henry Chisholm, Cleveland, Ohio.

Railway switch, to Alonzo W. Cram, St. Louis, Mo.

Packing for journal-boxes, Edmund S. Hanna, Pittsburgh, Pa. He claims as a packing for journals, axles, &c., paper or paper-pulp which has been previously treated with the liquor or concentrated solution of chloride of zinc, etc.

Apparatus for applying chalk to locomotive-wheels, to Nathaniel Sehner, Hagerstown, Md.

Railway rail, to Theodore R. Timby, Tarrytown, N. Y.

Signal-light to Hartshorn White, Phillipsburg, N. J. He claims a locomotive head-light, consisting of the usual reflector, an opaque shield and colored ring, when said shield and ring are connected with suitable mechanism so as to render them capable of operation, as set forth.

Reissue patent for car spring to Erastus T. Russell, Indianapolis, Ind., assigned to the Union Car-Spring Company. He claims: 1. The combination of a hollow vulcanized india-rubber cylinder with an external metallic spiral spring, and an air space within said cylinder, which, when the cylinder or spring is under pressure, is closed against the escape of the air contained therein. 2. In combination with the elements named in the preceding clause, a metallic spiral spring, arranged within the rubber cylinder, and so as to give it increased internal support.

Train Dispatching.

Correspondents of *The Telegrapher* continue the discussion of the subject introduced by our contributor in his "Notes on the Management of American Railroads." One, who writes from Michigan and subscribes himself "Mac," says:

"The article in *The Telegrapher* of last week, over the signature of 'Grand Trunk,' leads me to inquire, What is the American system of train dispatching? There is, of course, but one method, which is, to repeat the words of 'Grand Trunk,' hold the train having the right of track and order the other train to proceed. Now, there are many different ways of doing this, and to those accustomed to any particular style of wording orders, etc., any other method seems to them unsafe. For instance, some companies will first hold the train having the right of track by order to the operator alone; others to agents alone; others to agent and switchman; and others by orders to conductor and engineer of the train in question not to pass a certain station until the train from the opposite direction arrives. This order is sometimes given to trains to not pass a station 30 or 40 miles distant, with several stations intervening, and trains of inferior class to meet, leaving an opportunity for the order to escape the mind of train-men. Accidents may happen, or many things occur to drive this important order from their memory.

"In this country railroad employees are continually changing from one road to another, and, during two years' experience as train dispatcher on one of the most important roads in the West, I came daily in contact with men from nearly every road on this continent, and the various and different modes of train dispatching advocated by them was really amusing. In view, therefore, of this wide difference in giving these orders, and the fearful results of their failing to be properly understood, is not a general and universal system much needed?"

"Mac" suggests that a convention of the chief train dispatchers be held to discuss the subject and adopt a uniform system. This is a good suggestion; but the discussion will be likely to be much more fruitful in result if there is a pretty thorough and long-continued discussion in the newspapers first. Such a discussion ought to bring out the weak points of prevailing systems and set people to thinking, and after that the dispatchers could meet and debate to some purpose.

Another correspondent of *The Telegrapher*, "P. J.," who writes from the Southern Minnesota Railroad, says:

"With a view to initiate an argument on this important sub-

fect, I would refer to the management of this, the Southern Minnesota Railroad, and that of the Milwaukee and St. Paul road, on most if not all of its branches. The system of the latter, which I do not deem the safest that can be adopted, is as follows:

"When it is desired to hold a train, the train dispatcher sends a message to that effect. The operator receiving it has orders to repeat it back, to show whether he has received it correctly; if so, 'O. K.' is sent in return. As soon as the message has been thus repeated the other train is ordered forward to meet the train which is held. As will be seen, by this system all depends upon one man—the operator. If he be negligent or careless we know too well what happens, &c. This is why I deem it unsafe.

"Note the difference between this system and that which is used upon this road, which is as follows: A message is forwarded to the conductor and engineer of the train to be held, and the operator receiving it delivers it immediately to the aforesaid parties, both of whom reply to the dispatcher, how they understand the order, and if they understand it correctly, receive in return their 'O. K.' Not until this is done is the opposite train ordered forward; from which the dispatcher also receives a similar 'understand' response, in reply to which 'O. K.' 'Go ahead' is sent. Then the conductor and engineer are positive all is right. By this system it is not necessary to hazard anything upon the carelessness or intelligence of one man.

"The St. Paul, while it is a fair plan, is by no means the safest that can be adopted; and, where so many lives and so much property are at stake, only that plan which is manifestly the best and surest should be used. There is no necessity for the station agent having any responsibility in the matter. Generally he has enough to attend to without being held responsible for the movement of trains.

"While I cannot say I agree with what 'Hindoo' says, he is partially correct."

Hannibal & St. Joseph Railroad Report.

The Hannibal & St. Joseph Railroad Company owns a railroad from Hannibal, Mo., west to St. Joseph, 207 miles, and also owns the Quincy & Palmyra Railroad, from West Quincy, Mo., southwest 15 miles to a junction with the main line at Palmyra, 15 miles from Hannibal; and it also owns the Kansas City & Cameron Railroad, from Cameron, 36 miles east of St. Joseph, southwest to Kansas City, 53 miles. It has thus 275 miles of road, forming a trunk line across North Missouri, with two termini on the Mississippi and two on the Missouri. The following is an abstract of the report for the year ending August 31, 1871:

The earnings of the line for the past two years were as follows:

	12 mos. ending Aug. 31, 1870.	12 mos. ending Aug. 31, 1871.
Passengers.....	\$1,258,225 25	\$1,101,394 58
Freight.....	1,882,070 86	1,765,753 98
Mails.....	41,636 16	45,012 26
Express.....	43,094 38	36,692 45
Telegraph.....	3,539 87	3,985 41
Miscellaneous.....	33,549 87	30,367 80
Rents and local tolls on Kansas City Bridge.....	71,734 49	83,524 91
Car mileage.....		38,237 98
Total.....	\$3,340,224 88	\$3,104,969 37
Operating expenses (including taxes).....	2,210,803 30	2,015,934 57

Net earnings.....\$1,129,421 58
Proportion of expenses to earnings, including taxes, for 1870, 69 10-100 per cent.; for 1871, 64 95-100 per cent. Proportion of expenses to earnings, exclusive of taxes, for 1870, 67 64-100 per cent.; for 1871, 62 51-100 per cent.

The operating expenses have been divided, the transportation of passengers charged with 37 18-100 per cent., and the freight transportation with 62 82-100 per cent. of the whole expenditure.

Twenty-seven per cent. of the yearly expense has been charged to the maintenance of road and bridges; 10,425 feet of additional side track has been laid; 3,100 435-2240 tons of new and re-rolled iron, and 105,197 cross-ties placed in the track and charged to this account.

The decrease in passenger earnings was 12 per cent., chiefly in local business; the decrease in freight earnings was about 6 per cent., also chiefly local. Of the expenses, 27 per cent is charged to the maintenance of road and bridges, and 24.67 per cent. maintenance and operation of motive power. The equipment at the close of the year consisted of 41 passenger coaches, 21 baggage, mail and express cars, 36 caboose cars, 5 coaches used as caboose cars, 162 grain and merchandise cars, 745 combination cars, 124 open-stock cars, 248 flat cars, 122 coal cars, all used for traffic; and 26 dump cars, 75 hand cars, 3 snow plows, 2 wrecking cars, 1 pay car and 1 pile-driver car, which are used in maintenance and construction.

There were added to the equipment during the year, 1 locomotive, 10 passenger, baggage, mail and express cars, and 153 freight cars; 69 miles of fence were built, material provided for 20 miles more, 134 miles of track ballasted, the embankment in the 15 miles of the Mississippi bottom, between Quincy and Palmyra, raised and ballasted, new water-works erected at Palmyra Junction and St. Joseph, a new passenger house at Chillicothe completed, stalls for five engines added to the round-house at Brookfield, and for two to that at St. Joseph, eight coal shuttles put up at Bevier and a coal shed at Hannibal.

There were expended during the year:

On account of interest.....	\$783,499
On account of the Kansas City & Cameron Railroad, for grounds, stock yards, grading, etc., at Kansas City, and for balance of old construction account.....	87,863
Balance of old construction account.....	24,438
Construction, equipment, etc.....	865,937
Land department expenses.....	99,636

Total.....\$1,361,383
The Trustees of the land mortgage expended during the year ending December 31, 1870.....\$406,166
In the purchase of the land bonds of the company amounting to.....369,600

The accrued interest and principal was.....\$36,566
There was received for lots and sleeping cars sold.....9,500
And there were issued in excess of five years notes and bonds exchanged fifteen years eight per cent. bonds, amounting to.....571,500

The proceeds of which have been applied to the extinguishment of the floating debt and payments for expenses of new equipment, construction, etc.

The statement of the Land Department shows the purchase to January 1, 1871, with proceeds of sales of lands, and the cancellation of old land bonds amounting to.....	\$220,500 00
New land bonds amount to.....	2,217,050 00
1,457 13-100 shares preferred stock at \$81.....	121,436 67

Total.....\$2,558,976 67
The balance of the Trustees' account is.....213,828 38

Which has been invested in land bonds since January 1. The assets of the Land Department are, the unsettled payments on contracts for the sales of lands, including interest to

maturity, amounting to \$3,445,279.33, subject to cancellments of contracts which may be forfeited for non-payment; and the lands remaining unsold amount to about 109,500 acres, which, together with some of the lands already sold, are subject to claims under the swamp land grant, which are and may be made in conflict with the claims of the railway company under the grant to it.

The other assets of the company consist of the working accounts, amounting to \$659,901.54; and the current liabilities are \$591,884, and the interest due Sept. 1 is \$144,612.

Then there are county and other bonds and stocks, received for subscriptions to the stock of the company and in payment for other things, and coupons amounting at par to \$373,886, which have no current market value, and if a sale should be forced would probably sell so low (perhaps for no more than forty or fifty per cent. of their par value) that it is considered more profitable, or at least economical, for the company to retain them for the present, if possible, than to attempt to realize upon them.

GENERAL OR CAPITAL ACCOUNT, AUGUST 31, 1871.

Cr.	
Construction expenses.....	\$7,734,717 94
Engineering expenses.....	192,614 35
Interest, discount and exchange.....	6,443,116 76
Fencing.....	168,521 41
Expenses and contingencies.....	456,040 86
Equipment.....	\$14,995,011 32
Telegraph.....	9,948,433 18
Depot grounds.....	17,156 44
Depot buildings.....	114,660 05
Right of way.....	553,012 45
Quincy & Palmyra Railroad.....	59,567 34
Kansas City & Cameron Railroad and Bridge.....	339,703 37
468 shares Pullman Palace Car Company's stock.....	2,192,833 27
State sinking fund.....	46,800 00
Land department expenses.....	1,900 00
Fiscal agency account.....	437,535 32
	111,264 13
Total.....	\$31,818,227 37

Dr.	
State bonds at 20 years.....	\$1,500,000 00
Capital stock, 41,677 shares.....	1,560,000 00
Preferred stock, 50 873 24-100 shares.....	\$3,000,000 00
Six years' 10 per cent. mortgage bonds.....	4,167,700 00
Five years' notes.....	5,087,234 00
Fifteen years' 8 per cent. bonds.....	53,000 00
Quincy & Palmyra Railroad bonds.....	139,300 00
Quincy & Palmyra Railroad bonds.....	3,476,000 00
Kansas City & Cameron Railroad bonds.....	500,000 00
Land fund, cost of securities purchased by the trustees and delivered to the company.....	1,800,000 00
New mortgage land bonds.....	2,679,806 38
New mortgage convertible bonds.....	1,134,100 00
Balance of account.....	5,600 00
	375,496 99
Total.....	\$31,818,227 37

Northern Central Railway Report.

A general meeting of the stockholders of the Northern Central Railway Company was held in Baltimore on the 22d ult. The President of the road, J. D. Cameron, submitted the following annual report:

To the Stockholders of the Northern Central Railway Company:
GENTLEMEN: The directors herewith submit the following report of the operations of your road for the year 1871, together with the Treasurer's report of the financial condition of the company:

The earnings from transportation of freight were.....\$3,041,336 18
Earnings from transportation of passengers.....839,732 94
Earnings from transportation of express.....103,211 28
Earnings from transportation of mails.....39,682 50
Earnings from miscellaneous sources.....242,915 95

Total earnings for the year.....\$4,266,888 85
The operating expenses were:
For conducting transportation.....\$881,152 64
For motive power.....973,026 20
For maintenance of cars.....364,491 14
For maintenance of way.....708,065 20
For general expenses.....63,003 67

Total.....2,989,737 85

Net revenue.....\$1,277,161 00

The earnings, as compared with the previous year, were as follows:

Increase from freight business.....\$164,590 83
Increase from express business.....18,489 06
Increase from miscellaneous business.....34,129 80

Total increase.....\$217,209 69

Decrease in passenger business.....\$38,585 42
Decrease in mail business.....350 00

Total decrease.....\$38,935 42

Increase of earnings over previous year (41 per cent.).....\$178,214 27

There were carried during the year, 1,091,356 passengers.

There were carried during 1870, 1,097,895 passengers.

Increase of passengers, 8,461.

There has been a decrease in the number of passengers coming from and going to other lines, but an increase in the number of local passengers. The increase in the local is attributable to an average reduction of 28 per cent. in the price of commutation tickets, which was made on the 1st of April last. The local passenger rates are now extremely low, and must certainly tend to build up a very large travel to points near Baltimore.

The amount of freight moved in 1871 was.....1,161,400 tons.
The amount of freight moved in 1870 was.....3,680,765 tons.
An increase of.....480,685 tons.

The percentage of increase was 13 per cent., being a gain of 6 per cent. on the increase of the preceding year.

The price received for moving one ton one mile in 1871 was 1 73-100 cents, being 17-100 of a cent less than 1870.

The operating expenses were 70 06-100 per cent. of the receipts, being 1 26-100 per cent. more than the previous year.

The percentage of working expenses might be materially reduced by charging to capital or construction account various items of expenditure, which, under the system adopted by the company, are now charged in the regular working expenses—such as new or extended sidings, iron or stone bridges erected in place of wood, steel rails in lieu of iron, and other items—all of which, in reality, add to the permanent value and improvement of your property.

We purchased during the year 1,900 tons of steel rails, a portion of which has been placed on the single track between York and Harrisburg.

The test made upon this road in the use of steel rail has been entirely satisfactory, and we are fully convinced that with the increased tonnage it is conducive to the safe and economical working of the road, and that the policy of the company should be to replace the iron with steel as rapidly as practicable.

The operations of the leased lines have been satisfactory. All of them show an increase in trade, while the Shamokin Division has increased largely in trade and profit.

The coal transportation on the main line shows a total of 788,472 tons. In 1870 it was 691,498 tons—an increase of 96,974 tons. The coal transported over the Shamokin Division

was 647,943 tons—an increase of 156,429 tons over 1870. The coal transported over the Elmira Division was 207,417 tons—an increase of 60,285 tons, of which 54,344 tons was bituminous and 5,949 tons was anthracite coal. The bituminous coal trade of this division is an entirely new trade, and this year will increase very rapidly. The mines at Ralston are now producing five hundred tons daily, and we have been notified by the coal company that they have orders for and will be prepared to ship one thousand tons per day after the first of May next.

The shipments of freight from Baltimore to points on the line of the road, and to connecting lines north and west, have increased.

With the completion of the Baltimore & Potomac Railroad and the Union Railroad, we shall have a very large increase in trade both North and South, and as the trade of the past year has taxed the equipment to its fullest capacity, we shall be compelled to acquire additional equipment during the coming year to meet this trade and the regular increased traffic on our line and from connecting roads.

There has been expended during the year \$708,065.20 by the maintenance of way department. The track has been maintained in excellent condition, and we have again the pleasure to report another year having passed without any accident having occurred to a passenger.

The equipment, both passenger and freight, have been improved, and the passenger trains have been provided with the Westinghouse brakes, which, we believe, add greatly to the safety of railroad travel.

The new line within the city of Baltimore has been completed and is now in use.

New sidings have been made and large coal trestles erected, and a number of other improvements made, which have added greatly to the convenience and economy of handling the trade.

Owing to the character of our leases and trackage contract for the use of the line beyond Elmira, we have been somewhat embarrassed in the operations of the Chemung and Canandaigua roads. To get a more perfect control of those roads, we have been endeavoring to secure them either by purchase or perpetual lease, and hope now to consummate some permanent arrangement.

There has been added during the year \$141,897.91 to the sinking fund, making the total amount now in that fund \$863,397.91.

It having become desirable to get possession of the majority of the stock of the Shamokin Valley & Pottsville Railroad Company, for the purpose of arranging for the bonded debt of that company, amounting to \$700,000, which matures on the 1st of August next, and for the payment of which we are responsible under the lease as authorized by you at your last annual meeting, we sold 12,034 shares of the stock of this company and purchased a like number of shares of that company. To meet the bonds referred to, and to purchase additional coal lands, the Shamokin Valley & Pottsville Railroad Company issued a mortgage loan for \$2,000,000, which bonds have been indorsed by this company and the Philadelphia & Erie Railroad Company.

The Shamokin Valley & Pottsville Railroad Company now own 6,000 acres of coal land, sufficient to provide a large amount of tonnage for this line, independent of all other sources.

The officers in charge of the different departments have performed their respective duties during the year to the entire satisfaction of the board. By order of the board,

J. D. CAMERON, President.

Union Pacific Railroad Report.

The following is a summary of the report for the year ending January 31, 1871, presented at the annual meeting in Boston on the 6th instant:

EARNINGS.		EXPENDITURE.	
Passage earnings.....	\$3,123,510 08	Conducting transportation.....	\$667,815 91
Freight earnings.....	3,276,553 50	Motive power.....	1,251,975 77
Company freight.....	352,935 44	Maintenance of cars.....	312,874 06
Express earnings.....	307,731 32	Maintenance of way.....	964,100 75
Mail earnings.....	283,748 80	General expenses, including taxes.....	403,800 37
Car service.....	57,439 13		
Rent of buildings.....	15,809 51		
Miscellaneous.....	103,834 38		
Total.....	\$7,321,683 16	Total.....	\$3,600,566 86

—being 47 87-100 per cent. on earnings, and leaving the net earnings for the year 1871 at \$3,921,115.30.

The total amount of revenue, as compared with last year, is as follows:

1870.....\$7,625,277 11
1871.....7,321,683 16

Showing a decrease of (11 per cent.).....\$103,594 95

The expenses compare as follows:

1870.....\$4,677,414 84
1871.....3,600,566 86

Showing a decrease of (23 per cent.).....\$1,076,847 98

An increase in the net earnings is shown as follows:

Net earnings in 1871.....\$3,921,115 30
Net earnings in 1870.....2,947,863 27

Increase (33 per cent.).....\$973,253 03

The foregoing report is supplemented with comments, which go on to say that the revenues for the company for the year have fallen considerably below the estimate, owing mainly to the detention caused by the storms which have prevailed throughout the entire winter. The weather has been unprecedentedly severe, and precautions which, according to the experience of all previous years, were ample, proved insufficient. Everything, however, that, in the opinion of the Chief Engineer and General Superintendent, would expedite the traffic upon the line and secure the comfort of those who were delayed was provided, and it is believed that no actual suffering resulted from the detention. By judicious management in the operation of the line the net earnings, it will be seen, show a handsome increase over those of last year and approximate the estimate made in the report submitted at the last meeting.

The bridge over the Missouri, at Omaha, has been pressed to completion, and will be open in a few days for the passage of trains.

The operations of the Land Department during the year have been satisfactory. The number of acres sold from March 1 to December 31, 1871, to 1,182 purchasers has been 192,275.82-100, yielding in cash \$733,581.85, an average of \$3.81 per acre. The cash receipts of the Land Department from March 1 to December 31, 1871, has been \$319,689.49, and out of these \$229,000 of land grant bonds were canceled by that department and over \$80,000 remitted to the trustees under the mortgage securing the same. Up to the close of the year 1871, 500,000 acres have been sold in all, yielding \$2,102,123.96—an average of \$4.20 9-100 per acre; and the amount of land grant bonds canceled has been, by the department, \$935,000; by trustees, \$251,000; and for the balance, the company land notes, maturing in one, two and three years, with interest. The receipts have thus far been more than sufficient to take care of the interest upon the outstanding land bonds.

The President closes his report as follows:

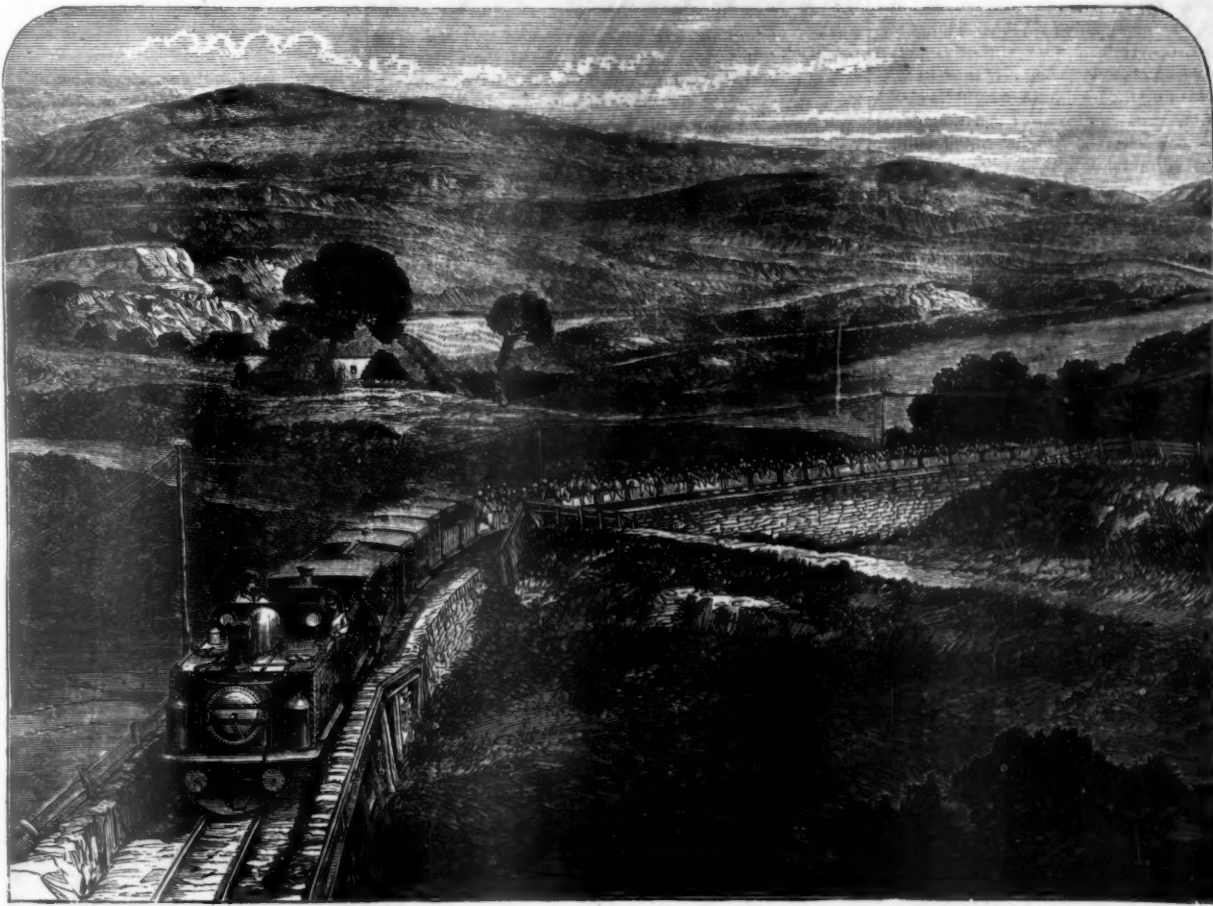
"Your road, with proper management, can always promptly provide for the interest on the first mortgages, land grant and income bonds; and by a judicious development of its through and local business, should within a few years be able to make yearly provision for the government liens, and also become remunerative to its stockholders."

The Festiniog Railway.

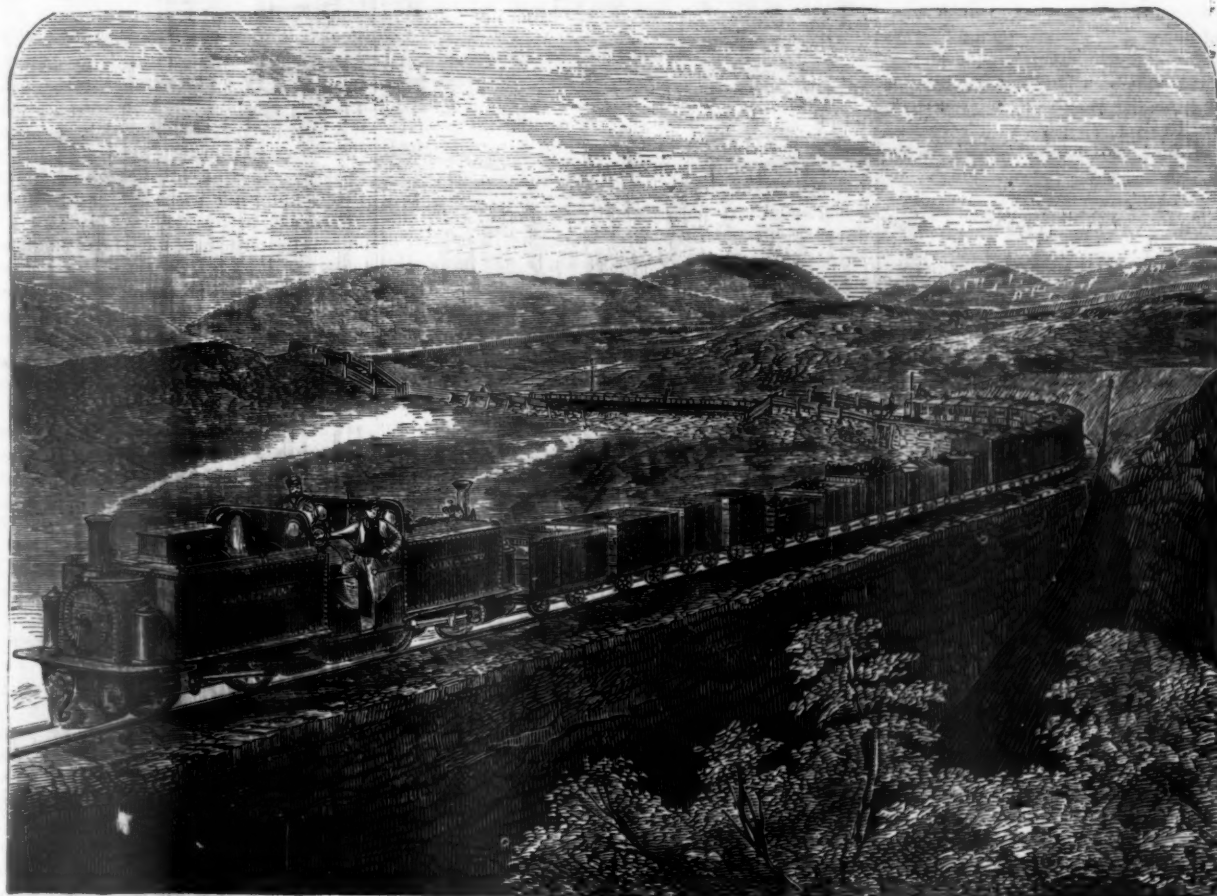
We copy from *Engineering* two views, taken from photographs, of the appearance of trains on different parts of this famous lilliputian railroad, which has a gauge of only 23½ inches. The road extends from the harbor of Portmadoc to slate quarries at Dinas, near Festiniog,

per mile. There is one gradient of about 66 feet per mile for 2½ miles, another for a similar distance of about 63 feet per mile, and one for two miles of 68½ feet per mile, and for 12½ miles the average gradient is 57 feet per mile. The line is composed almost entirely of curves varying in radius from 115½ to 528 feet. These curves are of the parabolic class, very carefully laid out, and it is

Many of the embankments consist of dry stone walls. The road was commenced in 1832 and was worked as a tramway until 1863, when locomotive power was adopted at the recommendation of the engineer, Mr. C. E. Spooner. The rails first laid weighed 16 pounds per yard; these were replaced many years ago by others weighing 30 pounds per yard, and these latter have been



DESCENDING TRAIN ON THE FESTINIOG RAILWAY.



ASCENDING TRAIN ON THE FESTINIOG RAILWAY.

Wales, a distance of 13½ miles, with a branch about a mile long. From the harbor to the other terminus the rise is 700 feet, which is effected by various grades, all rising. With the exception of a portion on an embankment, the least gradient is 28 feet per mile, while the steepest is 77 feet

per mile. The width on embankments is ten feet at formation level, but in many cuts but eight feet. There are two tunnels, one 60 and the other 730 yards long, only just wide enough to pass the rolling stock.

found too light, and have been for the most part replaced by others weighing 48½ pounds per yard, which is six-sevenths the weight of the average rail used on American railroads of standard gauge. The rails are fastened by strong chairs to larch ties 4ft. 6in.

long, placed three feet apart from center to center, except at the joints, where they are two feet apart. The permanent way is maintained in the very best manner, the drainage being almost perfect. The excellence of this permanent way *Engineering* gives as explanation of the safety with which passenger trains are run at comparatively high speeds over this road. The road is worked with five four-wheeled locomotives weighing eight tons each, two of similar design weighing 10 tons each, and one double-truck Fairlie engine weighing 19½ tons. The latter, it is reported, will take up a train of 128 cars (mostly empty), the gross weight of cars and engine being 127½ tons, 21 tons being load; and returning the total train weight is about 336½ tons, 230 tons being paying load. The average proportion of dead to paying weight for the round trip is, therefore, 213 to 251, or about 5 to 6. The average in slate trains (going down) *Engineering* reports as varying from 1 to 3 to 1 to 2.

By far the largest part of the traffic is of slates, but in 1869, 97,000 passengers and 18,600 tons of freight besides 118,132 tons of minerals were carried. The operating expenses that year were about 44½ per cent.

Contributions.

THE SOUTHERN ROUTE TO THE PACIFIC.

NUMBER FOUR.

SAN FRANCISCO, March 6, 1872.

From a little foothill of the Sierra Blanca, covered with flints and harsh, rasping tussocks of grass, we first looked down upon the mystic Nile of America. A vast blackness of earth! The grim, morose and gloomy grandeur of that valley I have never seen equaled. So deep between the mountains, so dark, so desolate, so immense!

The Great Brave River of the North, the Spaniard called it in its plenitude of title. And a most singular stream is this same Rio Grande Bravo del Norte. A boiling, swift, turbid river, boun ded by dust, and that dust by desert gravel, and that gravel by sierras, whose white, hot tops look as if they would fizzle and steam if touched in its waves. A Nile in an Egypt twenty rods wide, with a Sahara twenty miles wide.

Like the Pecos, it was greatly swollen then (July) from the melting of snow in the mountains; and like that river, too, it is exceedingly crooked, and pours along its thick, argillaceous porridge—its rich blood-pudding—almost on a level with its banks. Wide, water-level flats—here floored with clayey ooze, there with Mexican adobe, square-cut by the sun-cracks—are choked with tall, arrowy *jaras*, or infant cottonwoods. Other flats are impenetrable willow brakes; still others, a trifle higher, are thinly covered with wide-branching cottonwoods, not like the spiry saplings on the Mississippi, together with clumps of the *ternillo*, or river mesquite, with its curious cork-screw pods. Shallow, treacherous bayous stretch across from bend to bend, amid hideous jungles of bushes and the cottony, fuzzy *cachania*; and everywhere it rings like a tuning-fork with the singing of mosquitoes.

For three weeks along the Rio Grande our principal occupation consisted in pulling oxen out of the mire. It was quite amusing to see an old fellow bogged down to his paunch, with his tail sticking straight out behind him, bogged down like his legs, and about a handful of mosquitoes at work around the roots of it where the skin was tender.

We reached the Rio Grande at a point about 90 miles below El Paso, and for about 100 miles as we ascended (except just below Franklin) there was not enough grass to pasture fifty cattle two days. For nearly two weeks the whole vast herd and all the horses of the train subsisted on mesquite pods; and the prairie cattle, being slow in accustoming themselves to this way of browsing, suffered not a little, and many of the younger ones perished. Wherever the narrow bottoms are not covered with jungle or shaded with the huge cottonwoods, they are quite naked and dusty, though incalculably fertile.

For a distance of sixty miles above Fort Quitman the bottoms on both sides together will not average above a quarter of a mile in width; from San Eleazario to Franklin (El Paso), where the Mexican settlements are scattered along, they are twice or thrice as wide. From these mere ribbons of bottom-land there slopes easily up to the sierras, eight or ten miles back, a gravelly *mesa* covered with *chaparral*, and totally worthless except for its mesquite beans. These beans grow in pods, from six inches to a foot long, brightly parti-colored, with only six or eight very small beans in a pod, sometimes a half bushel of them on quite a small bush. They keep ripening all summer, from the 1st of July until October, so that we saw green and ripe pods on the same bush all the way from one Colorado to the other. They are best for stock when comparatively green, being then full of sweetish pulp, like apple pumice when chewed; but af-

ter they are ripe the beans are so small and hard as to be of value principally for sheep and goats, though the Indians esteem them highly, and gather great quantities of them for winter supplies. The Mexicans on the Rio Grande pasture hundreds and even thousands of goats almost exclusively on mesquite pods, though the desert produces a few spires of grama grass during the rainy seasons.

It is astonishing what a dense population these mere threads of bottom-lands sustain where cultivated, even in the wretched Mexican fashion. From San Eleazario to Franklin we passed a number of villages and hamlets, each straggling along the road from a quarter to half a mile, and swarming with people. This is on the Texan side alone, and on the Mexican side it is much the same, only more are gathered into one town, El Paso. There is little of that celebrated town but one street; yet that is said to be seven miles long! After crossing that dreadful desert of the Llanos Estacados, one is surprised at the antiquity of the civilization here; the settled and routine appearance of things; the pudgy, little, whitewashed cathedrals, full of dark-eyed maidens in gaudy bodices and mantillas; the quaint and quiet simplicity of these utterly unsophisticated villagers; the enormous garden-walls of adobe; the harem-like and Oriental appearance of some of their inclosures; the teeming gardens. Indeed, when we passed through one of these hamlets at the time of the mid-day siesta, I was forcibly reminded of Pompeii, so quiet was it between the low, dead, windowless walls, in the narrow, unshaded streets, with no one in sight save here and there an old hag perched like a witch on the corner of her flat roof, watching lest some of our rough scamps, indescribably hungry for vegetables, should vault over and pluck her onions. And the strangest thing of all is, that this civilization has been here so long, even centuries, and yet any day the yelling Apaches may swoop like fiends through the single street of some exposed hamlet, in broad midday, and carry off captives and cattle with impunity; that is, with impunity, were it not for the United States soldiers.

The explanation of this populousness must be sought in the extraordinary fertility of the river-flats, and the facility with which they can be irrigated. The Rio Grande is scarcely less infallible than the Nile in its annual swelling and recession, and is at its highest when most needed. Rising so near the level of its low banks, the water is easily carried out over the fields in earthen aqueducts (not ditches), from which, wherever tapped, the water flows down between the long rows of maize. Rich as they now are, these flats will need no manuring forever, for the water is laden with silt. I never saw any water which is so thick and soup-like; it is said to be the heaviest water on the continent, not excepting that of the Mississippi.

It is not worth while either to describe the miserable agriculture of the Mexicans, or attempt to estimate their products. With the help of the second rainy season, beginning about the 1st of August, two crops can be grown, one of wheat and one of corn. I think most Americans would get twenty bushels of wheat and then sixty of corn from one acre within the season, though this would, probably, not be the best system of rotation. Alfalfa yields four or five times a year, and the "Western Guide-Book" which we had related an instance where an American sold \$1,200 worth of that grass in a single season from one acre! This story is not incredible, though it is an exceptional instance, because of the high prices paid by government trains for forage. The success of corn leaves little to be desired, when cultivated by Americans. The wheat is very pretty, plump and white, but makes rather heavy bread. The variety called "Sonora" wheat is still worse; it gives bread nearly as yellow as brass, and half as heavy. Pear trees grow to an enormous size, but the fruit is small, puckery and as nearly worthless as need be. So of most of the apples. The valley is subject to late frosts, which sometimes damage the fruit seriously. From the black Socorro grape the Mexicans manufacture a kind of indifferent port, sweetish and heady; yet I think the valley is better adapted to the grape than to the harder fruits. But if fruits do rather ill, at least the vegetables of the valley make many compensations. Probably the great, white, sweet onions of El Paso are the finest on the continent. They are proverbial all over Western Texas and New Mexico; and when the Texas Pacific Railroad is completed, the day will probably come when El Paso onions will be quoted in the New York markets.

It may be accounted a defect that there is no native grass on most of these river-flats, but they are too valuable to be abandoned to pasturage, and for the soiling of cattle the alfalfa abundantly suffices. California has yet to discover its one perfect grass, for even alfalfa cannot survive the rigorous and persistent drought of summer; but in all the region between the two Colorados this drought is cut in the middle, and alfalfa would live

through without irrigation. On alluvial lands it probably "fills the bill" as well as any cultivated grass ever can. Cattle do not take well to it, and it is coarse, but the enormous yield balances these defects.

From El Paso to the foot of the Jornada del Muerto the Rio Grande bottoms broaden with ample proportions, and here are the large and (for Mexicans) thrifty towns of Mesilla and Las Cruces. Here you shall see vast cornfields without a fence, as in Illinois, with here and there a naked-looking adobe or a wide-spreading cottonwood in the midst—stunted corn, on account of the miserable culture it gets, but almost black in its leaves, it is so green, showing the wonderful exuberance of the soil. The broad *mesas* are here less gravelly, and slope away mile upon mile to the foot of the silver-bearing Organ Mountains, looking quite green (in August) with their thin fleece of grama grass. Thousands of emigrant cattle were pasturing over them for weeks, and though each herd had sometimes spread itself to the diameter of a mile, still they looked like mere spots on the illimitable green.

As to the commerce of Rio Grande valley, a word. The amount of merchandise which reaches El Paso from Texan points east or southeast is quite inconsiderable, consisting chiefly of government supplies. The goods come the other way, from St. Louis, through Santa Fe, across the dreaded Jornada del Muerto, and so to Mesilla and El Paso and on down to Durango, or westward to Tucson in Arizona. But if the Texas Pacific Railroad, at the same time it is completed to El Paso, also has a branch reaching to the Gulf at Lavacca (port of San Antonio), it is my opinion that a great part of the goods for the Rio Grande valley, as far north as Fort Selby, and for Northern Mexico, will come *via* the Gulf, either through Lavacca or Galveston, and so by the Texas Pacific. From Lavacca to El Paso it is, say, 600 miles, all rail; from St. Louis to Albuquerque 1,000 (I have no map before me). Albuquerque is about the nearest point to which merchandise from St. Louis will come by rail, then they must be wagoned 300 miles further down the Rio Grande before they are ready to enter Mexico. Goods can be laid down in Lavacca by ship cheaper than in St. Louis by rail; then there is only 600 miles by rail against 1,300, part of which, too, is by wagon. St. Louis is already reaching a long arm into Arizona, not a little to the disquieting of San Francisco; and by the Atlantic & Pacific line these two cities will probably divide the trade of that Territory, though St. Louis will carry off most of that of New Mexico, as far south as Fort Selby; but the trade of that rich section, 100 miles in length, of which El Paso is the metropolis, and also of Northern Mexico, is quite within the grasp of the Texas Pacific.

It will be only a truism to say that this Rio Grande valley would yield far more commerce and farm produce if it were inhabited by Americans instead of Mexicans. If it were not for the United States garrisons the Apaches would soon enough clear the way for us; but as it is, the Mexicans will cling to that fat valley for centuries, even after a railroad is pushed through. Under any decent government, which does not undergo a revolution as often as the earth does, they thrive and multiply exceedingly. In Mazatlan, Colima, Guadalajara and other cities of Mexico, it is said that there are sometimes two or three women to one man, but in New Mexico and Texas the only circumstance which creates a disparity between the sexes is, that the Americans marry some Mexican women. But even then it is all gain to Mexico, for the children all have Spanish names, learn Spanish first and best, seek Spanish or Mexican associations, and submit themselves to Mexican traditions. The husband himself learns Spanish, and speaks it, while his wife frequently cannot utter ten words in English. The house is Mexican, the scullery is Mexican. Though he may resist stoutly at first, he inevitably submits, *poco tiempo*, to a regimen of black coffee and bread straight for breakfast, beans and mutton for dinner, and beans and mutton for supper.

STEPHEN POWERS.

Boiler Explosions.

TO THE EDITOR OF THE RAILROAD GAZETTE:

When a correspondent makes the extravagant statement that "any one in writing the particulars of the explosion of a locomotive boiler, will run no risk of misstating facts, ninety-nine times out of a hundred, by concluding with the words, 'The boiler was 20 years old and had just been patched,'" and a contemporary presents an array of facts that go to show he has done the very thing he so much deprecates, and jumped at a conclusion, and he cannot therefore meet his opponent fairly, let him do the next best thing: Part his hair in the middle, assume the proper garments and tell a story of a Western justice of the peace—or laugh it off as a joke and say he didn't mean it. This is effeminate, and it is expected. But the writer confesses that he did not expect that one who had so thoroughly studied his sub-

ject as your correspondent should have done, to make the above sweeping assertion, would pass over a chapter of accidents that had caused the death of ten of his fellow-men in the short space of three weeks, without giving the public the benefit of his knowledge as to the cause of this sad loss of life and destruction of property. The case of the boiler that was "20 years old and had just been patched," was exactly to his hand, and he substantially exclaims, "Just as I expected!" "I knew that old cow would eat up the grindstone." "The old story," says "W. S. H." This case so easily disposed of, it was very natural that the writer should desire more light, and he accordingly cited your correspondent to a number of boilers that were new which had exploded with terrible and fatal effect, hoping that he would as readily enlighten readers of the GAZETTE as to the cause of these explosions as he had done in the former case; but instead of this he proceeds to draw unwarranted conclusions as to the opinion of the writer. He says: "C. F. S. has arrived at the conclusion that, as none of the boilers that recently exploded under his notice were old and patched, new boilers are unsafe." C. F. S. neither said nor intimated anything of the kind. He did, however, intend to convey the idea that the "old story," while it might apply to boilers 20 years old, could not well apply to new ones, and intimated that in the latter case, instead of there being work for the master mechanic, it might be suggestive of work for the iron manufacturers. The writer distinctly stated that iron could not be too good for boilers, and also that the tests given of the tensile strength of $\frac{1}{8}$ in. iron were above that of the average new iron. Now, sir, if it is admitted that this iron was of superior quality when put in use, then this is the kind we should have in all our boilers manufactured at the present day. Are we getting it? Every locomotive manufacturer and master mechanic in the country knows that we are not—knows that we did not during the war, and this is why we are suffering now from the explosions of boilers made from iron manufactured during that period, when everything of the nature of iron met with a ready sale, so great was the demand and so limited the supply. "W. S. H." further says: "The difference of opinion in regard to boiler explosions is somewhat remarkable." Not at all. He makes the matter quite clear when he says, "Every man who has given the subject attention has his pet theory of the cause or causes of boiler explosions." He also says, "One cause of this diversity of opinion is the habit (for it is a habit) men have of jumping at conclusions." Your correspondent "knows how it is himself." He hears from a reliable source that a locomotive boiler at Portsmouth, Ohio, exploded, and that it was twenty years old and had just been patched, and he straightway asserts that this is true in ninety-nine out of a hundred cases of boiler explosions. Now this is, evidently, Mr. H.'s "pet theory," and he gives only this single instance upon which to base this assertion, and he is so bound up in this one idea that when a half-dozen other cases of boiler explosions are brought to his notice, of a character and under circumstances directly opposite to his pet theory, he is dumb and knows nothing about it. But even in this one case mentioned by your correspondent it is possible that this "habit that men have of jumping at conclusions" has so worked upon him as to seriously injure the cause of truth and justice. Let me illustrate: Not long since the writer of this, the master mechanic of the road, and a former draughtsman of an Eastern locomotive works, were passing through a round-house where there was a large number of engines of different patterns. Coming to one of very ordinary appearance, the draughtsman remarked: "That engine I designed 23 years ago." The writer was somewhat astonished, and took the liberty of asking the master mechanic how long this engine had been in service, and received the answer, "22 years." Had this engine exploded her boiler the next day "W. S. H." would have had one more case added to his list, and for fear it may do so soon, I hasten to explain. That boiler, the master mechanic said, was six years old. The tender, trucks, driving-wheel tires, axles, valve motion and cab had all been made new. The name (a modern one), was that the same? No, even the name had been changed.

Now it is possible that, had your correspondent made sufficient inquiry, it might have transpired that this Portsmouth boiler was not as many months old as it was said to be years. From the first locomotive ever made in this country—which exploded in a few months after being put upon the road; and the third, which exploded with only two years' service—to the present time, there have been more or less explosions every year. And there is not a road that is exempt, so far as the writer has been able to get any records. "W. S. H." says: "If some of our roads can get along thirty years without the loss of life or limb, it is singular that others may not be equally fortunate." That if was well put in. When he finds this fortunate road I hope he will give due information through the GAZETTE.

COARSE-SPUN FACTS.

Broken Rails.

NEW YORK, March 20, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice a very sensible article in your number of March 16 upon the subject of broken rails. The cause of these accidents is very well defined, but I think that the remedy suggested by you, although calculated to palliate the difficulty, will not prove to be, in all cases, entirely effectual. There can be no doubt that an inferior quality of iron rails will be much more liable to break than a good quality. Neither can there be any doubt that iron strained beyond its strength will be more liable to break than when subjected to a lesser strain; but I apprehend that a reformation in both these particulars will not entirely remedy the evil, so long as iron or steel rails continue to be imperfectly made; and so long as railroad managers and operatives continue to be careless in regard to the weight which these rails are required to sustain, and the foundations upon which they are to rest, we shall be startled at frequent intervals with these accidents, which are often the most terrible and fatal of the many to which all railroad transit is liable.

I have long been of the opinion, and have never hesitated to express it upon all proper occasions, that the simplest, cheapest and most effectual remedy, or rather preventive, for broken rails is to give them a continuous bearing upon longitudinal timbers of about eight by twelve inches in size, instead of an occasional bearing upon cross-ties or sleepers, as is now almost universally done. The same amount of timber per mile that is ordinarily used in a cross-tie track, if placed in longitudinal sills beneath the rails, with an occasional light tie, sufficient to keep the track from spreading, will, in my opinion, afford the rails a much more effectual and uniform support, and at the same time relieve them entirely from any liability to break. And even if from any cause they should happen to break, they will be held firmly in their places by the spikes until the train passes safely over them. I maintain also that with this plan of superstructure the iron rails may be a large percentage lighter than if laid upon cross-ties; also that the liability of axles and wheels to fracture and break will be very much diminished; also that the wear and tear of rolling stock will be materially lessened; also that a smoother track can be maintained upon an inferior road-bed—all which considerations are well worth looking after by our railroad managers.

If there are any serious objections to continuous bearings as compared with occasional or cross-tie bearings, I would like very much to have them pointed out by some good practical railroad man. I have in former years laid a good many miles of track with longitudinal sills, as above suggested, and have seen it used many years without an accident either from broken rails or axles, and I therefore think that I know whereof I speak. But the fact that it has gone so entirely out of use of late years has led me to call attention to the subject, in the hope that its discussion may eventually lead to some practical and beneficial results.

It appears to me to be the duty of every practical railway man in the country who has any well-considered views upon this important subject to let the railway and traveling world have the benefit of them, in order that, if possible, an effectual stop may be put to the terrible slaughter which is so frequently the result of accidents caused by the breaking of rails, wheels and axles.

S. SEYMOUR.

The Detroit River Tunnel.

We copied recently part of a letter to the Kalamazoo Telegraph which recounted some of the difficulties met in the prosecution of this work, and perhaps exaggerated them. The Detroit Free Press gives the following as a more strictly accurate account of the condition and prospects of the work:

The shaft on the Detroit side of the river, near the Detroit & Milwaukee elevator, was commenced early in December, 1871, and finished January 31, 1872, on which last mentioned day bed rock was reached, 108 feet below the surface of the river. The whole depth of masonry is 114 feet. The upper portion of this, 89 feet, is 15 feet in diameter and sixteen inches thick. The remaining 25 feet it has a diameter of 9 feet with 12-inch walls. The drainage tunnel or drift starts from the lower portion of the shaft, eight feet above the rock, thus leaving a well or pump below it in which to accumulate any water that may come into the shaft or drift. At present there comes into the shaft at its bottom, below all the work, water strongly impregnated with sulphuretted hydrogen gas at the rate of three gallons per minute. This causes no serious inconvenience, beyond the necessity of occasionally bailing it out. An inconsiderable amount of water, a few gallons per hour, also collects in the drainage drift, coming from layers of quicksand and eighteen inches thick, along the top of which the work has thus far progressed.

The drainage drift has been excavated under the river

to a point one hundred and thirty feet distant from the shaft, a daily average of over five feet. The ground through which it passes is a very hard clay, which has to be dug out with picks. A layer of boulders ranging from a few feet to a cubic yard in size is found in the clay, lying about half way up in the drift. Some of them have to be removed by blasting. Latterly they have been found smaller and less frequently, and proportionately better progress has been made—about ten feet during the last twenty-four hours. It is thought that they will soon run out entirely or dip below the bottom of the drift, in which case the progress of the work would be at once doubled. But two miners can work at a time, owing to the small size of the drift, but operations are kept up both day and night, the men being relieved every eight hours. The hardness of the ground, while it somewhat impedes progress, insures the security of the work. Portions of this drift have stood for a week unsupported, without exhibiting any signs of weakness. Ordinarily, however, the tunnel is lined with masonry within a day or two after being excavated. The lining consists of an eight-inch circle of the hardest brick, every one of which is subjected to a rigid examination and laid in the best hydraulic cement. The drift rises from the shaft to the center of the river on a grade of one foot in a thousand. The line was located by the engineers above ground by triangulation, and transferred below by means of a heavy plumb-bob immersed in water and suspended down the shaft by fine silk cords. As the distance between them was so short that an error of one thirty-second of an inch would throw the work out at the middle of the river six or eight inches, a drift has been run back from the shaft fifty feet, and an iron tube is now being sunk to its end, in which a plumb-line may be suspended and a longer range obtained. The drainage drift is not straight across the river, but has two short curves in it.

Within a week, work will be commenced on the shaft at Windsor, and as soon as it is sunk the drainage tunnel will be excavated from it to meet that now being worked from this side of the river. From what was learned of the nature of the ground in sinking the shaft, it is anticipated that the main tunnels will be surrounded the whole length with good solid ground, suitable for their construction, it being principally firm blue clay. The developments thus far have been quite as favorable as was anticipated at the time when the plans and estimates were prepared, and show nothing to discourage a reasonable belief that the work will be carried to a successful issue.

Railroad Patents.

Patents for the following inventions were granted during the week ending March 5:

Railway crossing, to William R. Hunter, Erie, Pa.
Casting car-wheels, to Johann Segmüller, Pittsburgh, Pa. He claims combining with the interior of a cast-iron car-wheel rim a wrought-iron or steel ring.
Rail chair to Levi S. Shreffler, Elmira, N. Y.
Car-axle box, to Timothy B. Stewart, Hartford, Conn.
Railway rail, to James A. Woolbury, Boston, Mass.
Car replacer, to Peter Cartwright, New York.
Car-coupling, to Aaron K. Kline, Readington, N. J.
Car-coupling, to James H. Akin, Wyandotte City, Kan.
Safety-step for railway cars, to Benjamin F. Beckwith, James H. Rynerson and Alexander N. Clark, Clayton, Ind.
Railway-track cleaner, to Alexander Blakely, Fairfield, Iowa.

Apparatus for propelling street cars, to Henry C. Bull and Benjamin Bloomfield, New Orleans, La.

Pneumatic railway signal, to Joseph Olmstead, Providence, R. I. He claims the combination of an automatic sight or sound railway signal, capable of being operated by an artificial current of air, with an air-pump operated by mechanism which is actuated by a passing train, a reserve chamber and connecting pipes.

Railway stock-car, to Samuel Rorer, Taunton, Mass. He claims: 1. The transverse partitions carrying the troughs and united by horizontal hinge-joints with the upper part of the car, or some part fixed thereto, and arranged at such fixed distances apart that any one partition may be swung up to the roof without interference with or requiring the movement of the other partitions. 2. In combination with the partitions, the grain and water receptacles, arranged centrally in the top of the car, within the longitudinal central ventilator, and connected with the troughs in said partitions by flexible or jointed tubing or conduits. 3. The transverse partitions, extending up to the side of the car at one end and shortened at the other end so as to leave between them and the side of the car the longitudinal passage extending the length of the car, in combination with the doors arranged at each end of the car, opposite to or in line with said passage.

Railway-switch, to Thomas Turner, Clifton, Canada.
Turn-table for swing-bridges, to George Walters, Phoenixville, Pa., assignor to the Phoenix Iron Company, of the same place.

Relief-valve for steam air-brake cylinders, to George Westinghouse, Jr., Pittsburgh, Pa.

Steam-power air-brake and signal, to George Westinghouse, Jr., Pittsburgh, Pa.

Steam air-brake to George Westinghouse, Jr., Pittsburgh, Pa.

Patents were re-issued for a water-tank for railroads, to John Burnham, Batavia, Ill.; steam-brake for railroad cars, to Samuel N. Goodale, St. Louis, Mo., assignor to Goodale Steam Car-Brake Manufacturing Company; car for carrying petroleum, to John Clark, Canandaigua, N. Y.

Tiffin Car Works.

This company filed certificates of incorporation with the Secretary of State of Ohio on the 5th instant. The capital stock is \$1,000,000, in shares of \$100; incorporators, Rabin Shawman, John D. Loomis, John M. Naylor, Scudder Chamberlain, William W. Armstrong, John Neigh, Samuel B. Sneath, John U. Kaul, John T. Hess, Alfred G. Sneath and Warner P. Noble.



Published Every Saturday.

A. N. KELLOGG, Proprietor.

S. WRIGHT DUNNING AND M. N. FORNEY, Editors.

W. H. BOARDMAN, Acting Publisher.

CONTENTS.

ILLUSTRATIONS:	Page.	EDITORIALS:	Page.
The Festinog Railway.....	125	Among the Shops.....	129
CONTRIBUTIONS:		EDITORIAL PANORAMAS.....	130
The Southern Route to the Pacific.....	126	CHICAGO RAILROAD NEWS.....	130
Boiler Explosions.....	127	GENERAL RAILROAD NEWS:	
Broken Rails.....	127	Personal.....	130
EDITORIALS:		Elections and Appointments.....	131
Erie.....	128	Traffic and Earnings.....	130
The Canada Southern and its Relations with other Lines.....	128	"Old and New Roads.....	131
The Western Ticket Agents' Meeting.....	128	MISCELLANEOUS:	
Kansas City and the Northwest.....	129	The Detroit River Tunnel.....	127
		Railroad Patents.....	127
		On the Application of Electricity to the Regulation of Railway Traffic.....	133

Editorial Announcements.

Address.—The RAILROAD GAZETTE will be printed for the present in New York; our printing house in Chicago having been destroyed. All communications, therefore, whether editorial or business, should be directed to the New York office. The proprietor will receive subscriptions and advertisements at his office in Chicago, Nos. 63 and 65 South Canal street, but letters should be addressed to New York.

Correspondence.—We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Inventions.—No charge is made for publishing descriptions of what we consider important and interesting improvements in railroad machinery, rolling stock, etc.; but when engravings are necessary the inventor must supply them.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

ERIE.

The developments of the past week have confirmed what we said last week with regard to the new management of this company and the character and objects of the combination by which the revolution was effected. It has been denied that the Atlantic & Great Western Company had anything to do with it; and it is altogether probable that that corporation had no legal connection with the plot. But it is not and cannot be denied that it was planned and executed by the leading proprietors and managers of the Atlantic & Great Western. As further proof, we see by London papers which have championed the movement organized by Bischoffsheim & Goldschmidt, as early as the 2d inst., that the leading features of the plan as executed were known there then. The *Railway News* of that date (a full week before anything was done or publicly known in New York), speaking of floating rumors regarding proceedings for the removal of the Erie directors, says: "That to which the greatest amount of credence is given is that, under the influence of General Sickles, the majority of the directors will be induced to tender their resignations, leaving Gould unsupported to contend with the incoming and opposing board." That was pretty well for a "street rumor" a week or two before the event. And in the review of the money market the same paper says: "The principal feature of the railway market was the rapid advance in the price of Erie shares, which at one time touched 32, owing to large purchases here on rumors of satisfactory arrangements as to the reorganization of the company. It was stated that ten seats at the board had been placed at the disposal of the shareholders, but that Jay Gould would still remain President of the company, as he declined to vacate his office until the period for which he had been elected under the classification act had expired."

The truth seems to be that the beginning of the plot was made by one George Crouch, a writer for the press, who entered the service of Gould and Fisk early in the career with Erie as an apologist and agent, and was best known by a pamphlet which he wrote in reply (or attempt at reply) to

the brilliant review articles of Charles Francis Adams, Jr. Gould and Fisk latterly not having literary employment for this man, he seems to have occupied himself by some original investigations connected with the life of Jay Gould and the opinions of his fellow directors. Finally, not many months ago, he sailed for England, apparently with some wares to sell; and from the fact that the McHenry and Bischoffsheim & Goldschmidt combination soon afterwards advertised for the support of Erie shareholders in a new project for reorganization, we infer that he found a customer. General Sickles seems to have adjusted the terms of the combination which Crouch had found possible, and the rest we know.

But while the American public was wholly gratified to find the old management removed, it could not be made to look favorably upon a new one which represented, not the stockholders, but Atlantic & Great Western proprietors. For two days the stock advanced not at all, and its subsequent great appreciation has been almost wholly owing to large orders from England. This public distrust has had its effect, and it is now hardly possible that any permanent contract with the Atlantic & Great Western or other corporation will be made until after an election, for which a law passed during the week and approved by Governor Hoffman on the 20th provides. This law repeals the famous (and infamous) "classification act," and provides that on the second Tuesday of July next there shall be an election, at which the inspectors shall be designated by the Chief Judge of the Court of Appeals, and at which all the stockholders of the company shall be entitled to vote on their shares. It also provides that the transfer books of the company shall be open for the examination of stockholders and their attorneys until the second Monday of June, and that transfers shall be made on these books to all holders of stock certificates until that time, with stringent provisions against the evasion of this. A final provision (introduced after the change of management) forbids the election as director of any officer of the Atlantic & Great Western Railroad Company.

Before our paper reached most of our readers, Jay Gould resigned his seat in the directory. On the same day (the 15th) the new Executive Committee (composed of John A. Dix, Homer Ramsdell, O. H. P. Archer, W. R. Travers and S. L. M. Barlow) issued a statement of the financial condition of the company. This gives the total capital stock and funded debt as \$112,995,210, besides \$3,386,000 of consolidated mortgage bonds issued but not sold. Of this \$78,000,000 is common stock, \$8,536,000 preferred stock, and the remainder bonds of various classes. It has in its treasury bonds (including collaterals for loans amounting to over two millions and a quarter) and other securities whose par value is estimated at \$6,171,100. The earnings for the months since Oct. 1 (up to which time the last report was made) are reported to have been at the rate of \$22,000,000 yearly; but these include receipts from 451 miles of leased roads whose capital accounts are not included in the above figures, and for which rentals amounting to \$1,117,000 yearly are paid. The road owned by the company, as nearly as we can ascertain from the reports, which are not very definite, is only the 469 miles between New York and Dunkirk, so the capital account is at the rate of more than \$240,000 per mile of road.

During the week the common stock advanced rapidly from 35, the day the new directors were legally chosen, to 52 on Tuesday last, the advance on the total sum of this stock amounting to \$13,000,000. There seems to be in England a contest for the control of the company at the approaching election between the Bischoffsheim & Goldschmidt and the Heath & Raphael parties, and in London the price reached 59. The dealings on the New York Exchange have been enormous, and though many of the sales, doubtless, have been speculative, there is no doubt that a very large part of the American holdings have been bought on English account, and there is every probability that the road will become almost entirely an English property, Americans being perfectly willing to part with their interest at the enormous prices now current.

The Canada Southern and Its Relations With Other Lines.

A great consolidation of the Canada Southern, the Chicago & Canada Southern, the Chicago & Northwestern and the Chicago, Rock Island & Pacific is prophesied by the *Chicago Tribune*, which has recently discovered that several of the directors of the Canada Southern are also on the Northwestern and the Rock Island boards—a fact to which we called attention a year or two ago. It argues entirely from the names of the directors, and says that the consolidation "if not formal and technical will be real," but if it studied the

names in connection with their position in other companies, it might feel less certain. For instance, Mr. Courtright, the President, and Mr. W. L. Scott, one of the directors of the Canada Southern, are not only directors of the Northwestern and the Rock Island, but of the Lake Shore & Michigan Southern also, and at one time at least were among the largest proprietors of the old Lake Shore Company. Now if their interest in the Canada Southern and the Chicago & Canada Southern leads them to secure all the connections possible for these roads, their interest in the Lake Shore and Michigan Southern, a parallel line with the same termini, should lead them to consolidate the Northwestern and Rock Island and such other roads as they can influence with that line. The truth is, it is not the easiest matter in the world to harmonize the positions of those who are interested at once in the Lake Shore and the Canada Southern. The Michigan line of the latter will be close along that of the latter, for a great part of the distance but a few miles from it, and if it gets any local business—as it must be expected to—it will take it from the Lake Shore road. The Canada line will not interfere at all with the Lake Shore's local traffic; but every car-load of its through traffic it must take either from that line or from its competitors. The question is, why should the proprietors of a railroad trouble themselves to construct a competing line? Have those who are displeased with the predominance of the Vanderbilt interest in the Lake Shore determined to divide its business? If so, it would seem, they should have commenced further east, and not remained dependent on the same Vanderbilt interest for an outlet to the seaboard. But such suppositions are unnecessary. The Canada Southern is built with special reference to a through business and a freight business. Its remarkably easy grades should enable it to conduct a heavy traffic with very much less expenditure for motive power than any of its competitors. And it must look to a through freight traffic for its earnings. It seems to have been designed with an utter disregard of local traffic, and to have hit upon a route where it will find less than any other east and west road through the same States. The towns and villages on its line between Chicago and Buffalo probably have an aggregate population much less than that of single towns on the Michigan Central and the Lake Shore. On the Canada line there is but one place (St. Thomas) of more than a thousand inhabitants, and the Michigan line, so far as determined, avoids nearly all important places, the only things cared for apparently being easy grades and curves and a direct line.

Now such a line as this is not likely to compete with its neighbors for local traffic, from the fact that it can hardly get enough to make it profitable. Neither will it be a very profitable route for passenger traffic, for though its easy line favors speed and safety, and these will attract through passengers, it has no great towns to fill its trains. But for through freight traffic it can compete with the best, and, on an equal traffic, make greater profits than any other road. This suggests that the road may have been designed for such a traffic; that in order to provide for the growing traffic between Chicago and the East it has been thought better to provide a new freight railroad rather than new tracks for freight along the old Lake Shore road, most of whose traffic from points east of Chicago cannot be diverted to the new road, and whose tracks from Toledo eastward have and are likely to have as much business as they can easily accommodate. On this supposition the apparently conflicting interests may be harmonized, and the new route from Buffalo to Chicago may be not only a Courtright road and a Tracey road but a Vanderbilt road, which can carry freight at a very small cost, and at low rates may have pretty much all the freight it can carry, even with "double tracks and steel rails."

The Western Ticket Agents' Meeting.

The official report of the proceedings of the meeting of Western ticket and passenger agents, held in St. Louis, February 14, gives a more accurate and definite account of what was agreed upon there than the report we published shortly after the meeting. The most important was the adoption of the following memorandum of agreement concerning colony tickets, which there and afterward was signed as below:

In order to make more clear the basis of the agreement adopted at Philadelphia, September 27, 1871, in regard to the abandonment of colony rates, we, the undersigned, for our respective lines, do hereby agree (provided that all lines in competition with us join herein):

First—So-called colony rates are hereby entirely discontinued. For all parties moving westward, either in large or small numbers, regular first or second-class rates shall be demanded.

Second—First-class tickets shall not be sold at second-class rates, and holders of second-class tickets shall receive only the accommodations provided for second-class passengers.

Third—Free passes or tickets shall not be given on account of colony or emigration business.

Fourth—No excursion rates shall be given, or round trip tickets sold, or cars or trains chartered, between points east of the Mississippi River and points west thereof.

J. Charlton, Chicago & Alton; John S. Cook, Peoria, Pekin &

Jacksonville; F. R. Myers, Pennsylvania Company and Pittsburgh, Cincinnati & St. Louis; C. E. Follett, Vandalia Line; C. K. Lord, Indianapolis, Cincinnati & Lafayette; S. F. Pierson, Cleveland, Columbus, Cincinnati & Indianapolis and Indianapolis & St. Louis; P. B. Groat, Hannibal & St. Joseph; E. A. Ford, Missouri Pacific and Atlantic & Pacific; S. K. Hooper, Louisville, New Albany & Chicago; W. R. Allen, St. Louis & Iron Mountain; A. Anderson, Jeffersonville, Madison & Indianapolis; W. L. Malcolm, Toledo, Wabash & Western; John Foggitt, Springfield & Illinois Southeastern; C. J. Ives, Burlington, Cedar Rapids & Minnesota; H. S. DePew, St. Louis, Alton & Terre Haute; John W. Mass, St. Louis & Southeastern; F. Chandler, St. Louis, Kansas City & Northern; A. E. Touzalin, Burlington & Missouri River; Samuel Powell, Chicago, Burlington & Quincy; E. St. John, Chicago, Rock Island & Pacific; H. P. Stanwood, Chicago & Northwestern; Samuel Stevenson, Cincinnati, Hamilton & Dayton; W. P. Johnson, Illinois Central; W. B. Hale, Ohio & Mississippi; W. B. Shattuc, Atlantic & Great Western; C. D. Whitcomb, Michigan Central; H. C. Townsend, Toledo, Peoria & Warsaw; John W. Brown, Indianapolis, Bloomington & Western; J. W. Cary, Lake Shore & Michigan Southern.

A committee appointed to report on the subject of the payment of excessive commissions by certain companies reported in favor of urging the General Ticket Agents' Association to prescribe a uniform tariff of commissions to and from all common points, to be adhered to until altered by the agreement of all lines interested. This report was tabled.

A resolution was adopted that thereafter none but general ticket agents, or duly accredited delegates of the railroads, be admitted to the meetings.

The next meeting is to be held at the Leland House, Springfield, Ill., May 15.

Kansas City and the Northwest.

On the authority of a newspaper correspondent that the proposed line of the Wyandotte, Kansas City & Northwestern Railway was from Kansas City through Leavenworth to Lincoln, we said a few weeks ago that "such a line would run alongside of railroads already built nearly all the way, and consequently, is not at all needed, unless it be to demonstrate the vast advantages of the narrow gauge." An officer of the company corrects the statement by giving the proposed route correctly, which is not through Leavenworth, but considerably west of the Missouri River in a northwesterly direction through Oskaloosa, Grasshopper Falls, Holton and Seneca, or even still further west through Irving and Marysville, which will form a very good route for Kansas City. Our correspondent also says that when the road is completed to Grasshopper Falls, it is intended to form "a combination with the Kansas Central and over the two roads run through trains from this place [Wyandotte] and Kansas City to Denver," which is a good enough intention and may do for paving purposes, but in the carrying out of which Leavenworth will be likely to have something to say, it having created the Kansas Central for its own particular and private use, with the purpose, no doubt, to let its traffic go anywhere else in the world rather than Kansas City, which, though so near a neighbor (because so near a neighbor, perhaps) it does not love, but would annihilate with that fearful weapon, a narrow-gauge railroad. We remember when Leavenworth claimed the Missouri River, Fort Scott & Gulf as one of its roads, and announced its purpose to run trains through between Leavenworth and Baxter, condemning Kansas City to the limbo of way stations; but we believe the trains are not running yet, and we fear that we will have to wait long before the Kansas Central trains run into Kansas City. This, however, should not be a matter for mourning. The Wyandotte, Kansas City & Northwestern is very well located to secure the traffic which wishes to go to Kansas City, and, if Northern Kansas were not just now a little more crowded with railroads than with people, would be an exceedingly promising line. But it should depend upon the country on its line, and not on the intersecting railroads. It is all very well to talk about intercepting the traffic of cross lines; but the fact is the traffic won't be intercepted. When a railroad once has freight in its cars it is sure to carry it on its way as far as its line will permit, and it will be extremely difficult to turn traffic from the Kansas Central, the Central Branch and the St. Joseph & Denver roads before it reaches the Missouri. Let the managers of the new company depend more on their own road and less on those of their neighbors, and make their line (as light and cheap as they please) of standard gauge, so that it will be a part of the system of the country, and they may have a line of some value, at least to Kansas City.

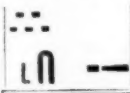
AMONG THE SHOPS.

THE JACKSON & SHARP COMPANY'S CAR WORKS.

These works are located at Wilmington, Del., which, as most of our readers know, is 23 miles south of Philadelphia, on the through line of railroad connecting New York with Washington. They manufacture all kinds of passenger and freight cars, from a Pullman palace to a hand car, and adapted to all gauges, from the broadest to the narrowest. They have also in connection with their car works a department in which they manufacture doors, sashes and blinds, and also a ship-yard and marine railroad, the latter capable of taking up vessels of 500 tons burthen, and the yard furnishing facilities for building every class of vessel for coastwise traffic. The ground on which these works are built is located between the Brandywine and Christiana rivers, with a water front on each, and a depth of seven feet of water in the former, and 14 in the latter. This gives ample facilities for receiving and shipping all kinds of material on the one side, and for launching vessels on the other. The buildings front on the Philadelphia, Wilmington & Baltimore Railroad, and, as the time on the fast trains is only one hour to and from Philadelphia, the location of the works is very accessible both from the north and south, and, as the Philadelphia, Wilmington & Baltimore Railroad connects with both the Pennsylvania Railroad and the Baltimore & Ohio, cars can be shipped to the North, South, East or West.

The buildings of this establishment, like these of nearly all

large works, have been the result of growth rather than of creation. Their plan, though not exactly irregular, is yet what might be called indefinite, and evidently their arrangement, as it at present exists, is the result of a process of accretion, and not of a carefully matured design. The plan of the main building is somewhat like a big inverted letter U with a small L in front of it, thus—L. The vertical part of the L fronts on the Brandywine River, and the Philadelphia, Wilmington & Baltimore Railroad runs underneath parallel with the printed lines. The ship-yard is located on the right of the U and the lumber yards above it, so that if we represent the latter with periods and the ship-yard by an exclamation point turned on its side, the railroad by two parallel rules, and the water front of the Brandywine by a vertical, and the Christiana by a dotted line, we will have the following diagram, which will give an idea of the general location of the buildings:



The letter L represents the planing mill, or rather the building in which the planing mill is located. It is 170x65 feet and two stories high. The upper part is occupied by light machinery for doing sash and door work, and a portion of the lower part of the L by the machine shop. The lumber is brought from the "periods" to the planing mill, and there sawed and dressed to the proper dimensions. Thence it is carried to the left leg of the inverted U which represents the setting-up shop in which the cars are erected, and as they progress are moved to the upper end of the shop. The horizontal part of our letter U represents what is called the transfer shop. In this are two tracks for trucks, by which the cars can be transferred from the setting-up shop to the right leg of the letter U, which represents the paint shop, which contains four tracks connected by a switch with the Philadelphia, Wilmington & Baltimore road. The setting-up and paint shops are located on ground which is higher at the end next the railroad than at the other, so that what is the first floor at the railroad becomes the second floor at the other end. On the lower floor under the setting-up and transfer shops the heavy work, such as trucks, platform and hand cars, is built. There is also a glue room with every facility for glueing up all kinds of panel and other work, and a drying room, whose temperature is about 155 deg., for thoroughly drying the glue. The glue room is now being enlarged. On the same floor is the tin shop. This part of the building is 65x340 feet.

On the upper floor the cars are framed together, and most of the inside work put in. The outside then receives a coat of priming before they are sent to the paint shop. The transfer shop is also used for doing the work of erecting the cars. Its size is 70x181 feet.

The paint shop is 70x420 feet. It has two stories, the upper one being used almost exclusively for painting and varnishing the cars. It is separated by tight doors from the other parts of the shop, so as to exclude the dust. The lower floor is occupied in part as a store room for the sash and blind work, of which the Jackson & Sharp Company do a large amount for ordinary building purposes. They have facilities for doing, and execute orders for, almost any kind of wood work for buildings, and have just completed the entire outfit for a church, including the pulpit, pews and all.

On the same floor are the varnish and upholstery rooms. The former has a very efficient ventilating apparatus, as it was found that varnish would not dry unless the air was constantly changed. Heat alone would not dry the varnish, unless its volatile parts were carried off by a current of air. A flue was therefore arranged to supply air, and a shaft provided to carry it off. The flue carries the air to a steam crib, where it is warmed to the proper temperature, and, by being heated, rises in the room. The shaft has an aperture next the floor, so that the cold air is drawn out while the warm air ascends. This arrangement represents very plainly not only a principle of ventilation but a peculiarity of human nature.

In one of the processes of manufacturing it is found that a bountiful supply of fresh air is requisite to effect a given purpose. As soon as this is discovered, the ingenuity of those in authority is exercised, and the whole object is accomplished perfectly and without difficulty. Now an exactly similar problem is presented in regard to the ventilation of cars, excepting that it is not directly a question of profit and loss, but of human comfort, health and life. In the one case the motive is strong enough to induce the proprietors of the Jackson & Sharp Company to exert themselves, and exercise some thought and ingenuity; in the other the railroad companies, who for the time at least control our bodies, are so entirely indifferent to or ignorant of our well-being, that they will take no thought or trouble in our behalf. The requirements for ventilation for human beings and for drying varnish are almost exactly the same. In each case the air in fulfilling its functions becomes surcharged with volatile matter, which unfits it for the purposes of respiration in the one case and drying varnish in the other. It must therefore be carried off and a continuous fresh supply be furnished. It is necessary, too, for human comfort that the body, and in the process of drying that car varnish should each be maintained at a comparatively warm temperature, and therefore if fresh air is supplied in winter it must first be warmed by the steam coil for the varnish room. Now it seems impossible to induce the managers of railroads to combine these two ideas in the ventilation of their cars. They will admit that fresh air is requisite for comfort and health, but they say, in effect, "Fresh air in winter is cold, which is uncomfortable, therefore we cannot have a constant supply of it," so they make openings to let the air escape, but none which will allow it to enter, and place exhaust ventilators whose operation is so strong that they will frequently draw the smoke down the stove pipes. In the arrangement of their varnish

room, the proprietors of the Jackson & Sharp Company saw that if the air which became surcharged with volatile matter was carried off, an equal amount of fresh air must be admitted. They also saw that if the air was warmed it would rise into the room, and if allowed to escape at the ceiling the warmed air would pass out at the ventilating shaft, and the cold air would remain at the floor. They therefore made the opening to their shaft at the floor, thus exhausting the coldest instead of the warmest air. Now to warm and ventilate a car thoroughly it must be done upon the same principles as are observed in the Jackson & Sharp drying-room. Provision must be made for admitting the air, and it must be warmed before it enters the car. This may be done by a coil of steam or hot-water pipe, a stove, or any other means which may be selected; the essential fact being that the air must be supplied and warmed, the means of doing it we will not discuss here, but only call attention to one other point in which the ventilation of the varnish room resembles that of cars. It is this: all ignorant people think that warmth alone is all that is required, both for comfort and to dry varnish. This delusion, so far as it concerns varnish, the drying-room of the Jackson & Sharp Company has effectually dispelled. We wish it were possible to make all railroad managers realize the same thing in regard to the ventilation of cars.

There is, however, danger that our description of these works may be open to the charge of being a dissertation on ventilation, the discussion of which subject the average human being always resents.

Of the quality of the work done at this establishment, it is perhaps as well that we should say nothing, because if we said what we thought, we would speak very favorably of it, which those who know the work need not be told; and if we did so, those disinclined by self-interest to hear it would take offense, and whoever is interested in knowing about it would better go and see for himself. This company is now building almost all kinds of cars, from Pullman drawing-room and Woodruff sleeping to hand cars. They have been the almost exclusive builders of narrow (3-feet) gauge passenger cars, and have supplied the entire passenger equipment to the Denver & Rio Grande and other narrow-gauge railroads. They were the first to adapt the American system of double-truck cars to the narrow-gauge passenger traffic, and our readers will remember that we published an engraving and description of one of their cars last fall in the GAZETTE of September 23. They now have several cars completed for a road of 3 ft. 6 in. gauge. This gauge gives width enough so that there is sufficient room for double seats on each side of the car. The dead weight of these cars will probably be less than 400 lbs. per passenger, which is considerably below that of those for the Denver & Rio Grande, as our readers will remember.

It is worthy of remark, in this connection, that thus far the managers of the Denver & Rio Grande Railway have not found it necessary to alter in any respect the plans and designs of the cars which have been furnished them by the Jackson & Sharp Company. This is largely due to the careful and skillful way in which they were designed by the Superintendent of these works, Mr. Wm. S. Auchincloss, who is better known as the author of the book on the "Link Motion." He has become connected with and interested in this establishment within a year or two, and now has the general management of it.

We have before referred to the fact that this company is at work on two Woodruff sleeping cars. These are of a new design by Mr. Woodruff, the pioneer of sleeping cars. We hope to be able, at some future time, to give in regard to them some more accurate data than is now possible. They attract attention at once, on account of the ends of the body being round instead of square, as usual. At each end there is a circular room, with a dome, which we believe is intended for ornament alone. They were not sufficiently advanced to enable us to describe them.

In addition to the buildings we have enumerated, this company have just completed a new blacksmith shop, boiler and engine-room. They have just put in a new Allen engine with 13x24 inch cylinder. This is one of the well-known high-speed engines, and runs 150 revolutions per minute. The boiler is of the ordinary locomotive pattern.

In the blacksmith shop we noticed a new Ferris & Miles steam hammer, which was very favorably spoken of by Mr. Auchincloss.

In the ship-yard—which is a branch of business that railroad men generally are not aware is carried on by the Jackson & Sharp Company—they now have one three-masted schooner and three barges on the stocks. About 50 men are employed in this department.

It should be added that about 60 cars are constantly in progress when the full force—600 men—are employed. About a million feet of lumber is constantly kept piled up in the lumber yard, so as to give it time to season. There is also a large drying room for drying lumber by steam. The lumber is piled on a coil of one-inch steam pipes, which covers the whole floor of the room. Steam is then kept on until the whole is thoroughly dried.

This company now has orders for 12 Pullman cars, several for the Woodruff Sleeping-Car Company, some for the New York & Oswego Midland, and a large number for other roads.

WILMINGTON CAR WORKS—BOWERS, DURE & CO.

Probably most of our readers will, on reading this, hear for the first time of the existence of this establishment. We are obliged to confess that we never heard of it before we saw their new shops. The proprietors bought the ground last November. As it is located on a hill-side, they were obliged to excavate and move 7,000 cubic yards of earth. They have done and have put up an erecting shop 70x200 feet, a two-story planing mill and machine shop 48x98, and a blacksmith shop 40x75; have put in an engine with 15x36 inch cylinder, and have it all running and several Pullman drawing-room cars half done. When they determined to go into business they bought a lease of a building containing some wood-working machinery, which they proposed to use until they could have their own shop ready. This leased

place took fire and burned down. Notwithstanding this, they are now in their new shops and hard at work on an order for six Pullman drawing-room cars, and have besides an order from the Providence & Worcester Railroad. They will soon commence work on a paint shop of the same size as the erecting shop. They will be located parallel to each other, and will have a transfer table between. The equipment of machinery, etc., is still quite small, but we noticed several machines which were new to us, one of them a "universal wood-worker" built by McBeth, Bentel & Margedant, of Hamilton, Ohio, which, it is said, will do almost anything with a piece of wood. Another was a very simple and ingenious machine for bending bars of iron in the blacksmith shop. Any one who has ever observed a blacksmith bending a bar of iron at a right angle will know the amount of time required to do it. In this machine it is done at a single stroke of a lever, and done with much greater accuracy than is possible in doing it by hand. The machine is made by Daniel Pennock, Kenneth Square, Pa.

Of the work which the Wilmington Car Works will do it is as yet impossible to speak, as none has yet been completed; but, judging only from the enterprise, energy and experience of the firm, or rather of some of its members, there is every reason to believe they will do only the best kind of work.

HILLIS & JONES.

After going through the two car establishments which we have described, we had a few minutes left to look into the works of this firm, which succeeds Robert H. Barr & Co. As most of our readers know, their specialty is radial drills, of which they make three sizes. They also manufacture a variety of machinists' tools, including drill and wheel presses, punch, shearing, boring, planing and milling machines, lathes, etc., etc. They are also doing considerable boiler work, and are now at work on a large contract for buoys for the United States government. The new firm is composed of young men who have started in business with a fair wind and good prospects ahead.

We regretted not being able to visit the other establishments engaged in manufacturing for railroads, but hope to do so on a future occasion. Considerable activity is apparent in both iron and wooden ship-building, and, notwithstanding the legislation which is regarded as adverse to this interest, the business seems to be improving.

It is reported that the Georgia Railroad & Banking Company, whose road extends from Augusta to Atlanta, with a leased branch to Macon, has agreed to indorse \$1,000,000 of the Port Royal & Augusta Railroad Company's first mortgage bonds, and has taken \$1,250,000 of its stock. This is a severe blow to the South Carolina Railroad Company, which has no other railroad connection beyond Augusta. It is reported that the Georgia Company has secured the Savannah & Charleston as well as the Port Royal road, and the two together will give it independent outlets to Charleston and Savannah as well as to Port Royal by routes just about as direct as those now existing—that is, the South Carolina to Charleston and the Central of Georgia to Savannah. This at once makes the Georgia an independent road with three termini on the sea board, two the largest cities on the South Atlantic coast and the third the best harbor, whereas heretofore it has been absolutely dependent on its chief rival, the Central of Georgia, for an outlet to Savannah, and on the South Carolina Railroad for connection with Charleston. Having secured its connection with the sea, it may now give its attention to interior connections, which might have been sources of embarrassment rather than strength so long as it had no secure outlet east of Augusta.

The Illinois law regarding grain transportation, with a very slight alteration, has been adopted in the upper house of the Missouri Legislature. This law requires that the railroads shall receive and transport grain for all shippers without discrimination; and load it either upon its track, at its depot, or at any warehouse adjoining its track or side-track; shall weigh the grain received and give a receipt for its true weight; and shall be responsible for the delivery to the consignee of the full weight, less $\frac{1}{2}$ of 1 per cent. It also provides that scales for weighing grain shall be kept where shipments of 50,000 bushels of grain per year have been made, and in case of neglect the sworn statement of the shipper shall be accepted as evidence of the true weight of shipments. It provides also for the delivery of grain to any warehouse on its track or accessible by any track which it can use, and to any consignee, and shall permit connecting tracks to be made from its line to any warehouse. Consignments are held subject to change of destination by the consignee and consignor previous to actual unloading, and consignees are entitled to hold the cars 24 hours for unloading, after actual notice of arrival at a proper place for such unloading. Railroads are required to deliver grain at all junctions of other railroads, and at canals and navigable streams—a superfluous provision, apparently, as previous sections require them to deliver at any place on the line where provision for delivery is provided.

THE SAN PAULO RAILROAD, in Brazil, on the 22d ultimo was visited by what was literally an overwhelming calamity, which is, we believe, unexampled in the history of railroads. A land slide occurred (whether by an earthquake or otherwise the advices do not say), by which the road for miles was moved from its foundation and buried under earth and rocks, so that, it is reported, two months' work will be required to put it into working order again. The accident has far-reaching effects, for it is said that more than one-half of the coffee in the country is shipped by that line, and it now has no outlet to the sea; so that the coffee market over a large part of the world is affected by this railroad accident.

PORTLAND, by reason of its deep-water harbor, has claimed that the produce of North America should be brought there for shipment, and in order that there may be the fewest obstacles to such shipments it has set about providing the necessary rail-

roads, and has pledged its credit to a considerable extent for that purpose. But the result seems not to be satisfactory to at least a portion of its people, and we hear now that they are circulating a pledge which binds the signers to vote against "any further assistance to railroads, either by loan of credit, issue of bonds, or guarantee of bonds."

THE CENTRAL PACIFIC has but recently issued its reports for earnings for the month of February and for the first two months of the year. The blockade of the Union Pacific, its eastern connection, which almost put an end to through traffic during those months, was expected to reduce materially its receipts; but the report shows that the earnings were larger than ever before for the same months—about one-eighth greater for February, and for the two months $15\frac{1}{2}$ per cent. greater than in 1871. The mileage is somewhat greater this year, and the increase has been in California where the country is comparatively populous. The reports of earnings show how independent of through business this road has become, and how important is its local traffic. Its receipts for the two months (probably the poorest in the year for traffic) were at the rate of \$1,081 per mile of road operated, or about \$6,500 per year.

General Railroad News.

CHICAGO RAILROAD NEWS.

Lake Shore & Michigan Southern.

The first train over the old line between Toledo and Sandusky was run over the road on the 12th inst., to the great delight of the inhabitants along the line. This section of road will be opened for general business about the first day of April.

The Northern Central road, which is ultimately to run to Sandusky and St. Johns in Michigan, is to be completed as soon as possible to the latter point. It is operated by the Lake Shore & Michigan Southern Company.

This company is at present sending out of this city every day an average of 300 loaded freight cars.

Work has been commenced on the new passenger depot on Van Buren street. This building, though in size the same as before, has been changed in several respects, some of which will add much to the attractiveness of the structure, and make it in all respects a model building. The immense size of the structure caused the old building to look flat and unimposing. To remedy this the Van Buren front is to be elevated somewhat higher than before, while the center and the south end of the building are also to have sections elevated two stories in height, which will contain rooms for the accommodation of the general officers. There will be six tracks in the building instead of five as in the old one.

Chicago & Canada Southern.

This road, now seeking entrance into this city, will probably be admitted to the great depot now in process of construction for the Chicago, Rock Island & Pacific and the Lake Shore & Michigan Southern Company, and it is understood that intimate relationships will be established between the new road and the Rock Island.

Atlantic & Pacific.

This company reports that it has bought iron enough to construct the road from this city to Elgin. Work will be begun upon this section as soon as the absence of frost will permit.

Chicago & Alton.

Mr. J. C. McMullin, General Superintendent of this road, has just received a note from Vice Admiral Possiet, at Pensacola, thanking him in the warmest terms for the courtesies extended to the Grand Duke Alexis on his late visit to Chicago, and expressing admiration for the management of the railroads of this country.

Messrs Fox & Howard, of this city, are about commencing the construction of an immense grain elevator at the junction of the Illinois & Michigan Canal with the South Branch of the Chicago River. The elevator will have a capacity of from 1,000,000 to 1,500,000 bushels of grain, and is situated directly on the line of the Chicago & Alton Railroad, as well as at the northern terminus of the Illinois & Michigan Canal.

The annual election for the choice of three directors will be held at the company's office in Chicago April 1. Transfer books were closed on the 22d inst. and will be reopened April 2.

Chicago, Danville & Vincennes.

This company has consolidated with the Western Indiana Railroad Company, having filed articles with the Secretary of State at Springfield on the 15th inst.

Illinois Central.

There are reports, apparently well founded, that this company may soon make an arrangement which will greatly improve its connection with New Orleans, and somewhat change its relations with Southern roads. At present it depends upon the Mobile & Ohio for connections both with Mobile and New Orleans, and to reach it the steamboat transfer must be made over the twenty miles between Cairo and Columbus, Ky. This gap it has been promised year after year would be closed by an extension of the Mobile & Ohio northward to a point on the Ohio opposite Cairo, but no signs of such an improvement are yet visible. Meanwhile, the Iron Mountain road has built a line down to a point opposite Columbus, established a transfer ferry, and runs its cars through from St. Louis to various southern points, unobstructed by river blockades, and when the river is closed below St. Louis has a very large traffic.

The report is that the Illinois Central may not continue to depend upon the Mobile & Ohio, but is inclined to enter into an arrangement with the Southern Railroad Association, which controls the line from Jackson, Tenn., to New Orleans, by which a new line will be constructed from a point opposite Cairo or Mound City southward to Jackson, Tenn., about 100 miles, and that

this will become the chief southern connection of the Illinois Central.

There is no doubt of the practicability of such a scheme, and it is altogether probable that the Southern Railroad Association desires a better northern outlet; but there are reasons why it should seek this otherwise than by a road from Jackson to Cairo. Such a road, to be direct, would have to be very near the Mobile & Ohio for its entire length; and, moreover, it is not the only nor the shortest route by which the Association can reach Cairo. It controls the Mississippi & Tennessee Railroad, which gives it a line from New Orleans to Memphis, and has an interest in the Mississippi River Railroad now in course of construction, which will complete a line from Memphis to Paducah. At Paducah it will connect with the Cairo & Vincennes road, which will give it an excellent outlet to the East and Northeast, but not to Chicago and the North. To secure the latter by way of the Illinois Central it need only construct a branch 50 or 60 miles long from a point near Troy north to Cairo, which would make a very direct route, and a line southeast from Cairo less than 40 miles long would make a less direct line; and this line would have the great advantage of having Memphis on it.

Michigan Central.

At a meeting of the directors, held on the 13th inst., the subject of providing funds to defray the cost of a double track was considered, and it was decided not to increase the capital stock, but to issue sufficient bonds for that purpose.

The bonds of such a company, which is managed with the utmost integrity, and whose shares have long paid 10 per cent. dividends, ought to find quick sale at the most favorable prices, and doubtless will.

As soon as the weather will permit, it is intended to commence the construction of a second track, of steel, between Detroit and Ypsilanti, 30 miles, and between Niles and Lake Station, 58 miles. Between Niles and Jackson the Air Line already provides a second track, and there will remain only the section between Jackson and Ypsilanti, 46 miles. The very great pressure of traffic on the road, much of it coming from its many new feeders in Michigan and Indiana, makes this increase of capacity necessary.

PERSONAL.

—E. H. Graves, late Land Agent of the Chicago & Northwestern Railway, having charge of the real estate, right of way, etc., a capable and estimable officer, has resigned to go into private business.

—Mr. Thomas S. Ridgway, of Shawneetown, President of the Springfield & Illinois Southeastern Railway Company from its first organization as the Illinois Southeastern, is pressed by his friends as a candidate for the Republican nomination as State Treasurer of Illinois. Mr. Ridgway is a banker, a man of character, and succeeded exceedingly well in securing the construction of his road at a time when it was not so easy as it is now to raise money for such enterprises.

TRAFFIC AND EARNINGS.

—The traffic receipts of the Great Western of Canada for the week ending February 23 were: 1872, £19,447; 1871, £17,479; increase, £1,968, or $11\frac{1}{2}$ per cent.

—The traffic receipts of the Grand Trunk Railway of Canada for the week ending February 27 were: 1872, £33,400; 1871, £29,800; increase, £3,600, or 12 per cent.

—The earnings of the St. Louis, Kansas City & Northern Railway for the second week of March were: 1872, \$51,870; 1871, \$47,025; increase, \$4,845, or $10\frac{1}{2}$ per cent.

—The earnings of the Indianapolis, Bloomington & Western Railway from the month of January were: 1872, \$101,075.64; 1871, \$60,245.95; increase, \$40,829.69, or 67½ per cent. And for the month of February: 1872, \$99,440.64; 1871, \$59,513.65; increase, \$39,926.99, or 67 per cent.

—The earnings of the Central Pacific Railroad for the month of February were: 1872, \$545,487; 1871, \$485,490; increase, \$59,997, or $12\frac{1}{2}$ per cent. The increase of the February earnings in 1870 is \$151,311, or 38½ per cent. The earnings for January and February were: 1872, \$1,179,967; 1871, \$1,021,989; increase, \$157,978, or 15½ per cent. The increase for the two months over 1870 is 46 per cent. Considering the snow blockade on the Union Pacific, which very greatly decreased through traffic during these two months, these reports are most satisfactory.

ELECTIONS AND APPOINTMENTS.

—Mr. A. B. Walters, formerly freight agent of the Marietta & Cincinnati Railroad, has been appointed Superintendent of the Transportation Bureau of the Board of Trade, vice Foote, resigned.

—The following have been chosen directors of the proposed Elyria & Black River Railroad of Ohio: R. B. Dennis, R. L. Chamberlain, E. B. Thomas, Darius Adams, J. W. Tyler, S. O. Edison and H. E. Mussey.

—A. M. Shaw, late of the Northern Railroad of New Hampshire, has been appointed Assistant Superintendent of the Vermont Central.

—At the annual meeting of Cairo & Fulton Railroad Company of Missouri, held in St. Louis on the 11th inst., Thomas Allen, W. R. Allen, J. W. Wallace, R. N. Nesbitt and W. R. Donaldson were chosen directors.

—Thomas Bell, Superintendent of the Detroit & Milwaukee Railroad, will retire May 1. It is reported that he will be succeeded by James H. Muir, but Mr. C. C. Trowbridge, President of the company, advertises that applications for the position, with suitable credentials, will be received by the directors during this month.

—The following appointments in the Jeffersonville, Madison & Indianapolis Railroad took effect March 1, at

the order of J. N. McCullough, General Manager of the Pittsburgh, Cincinnati & St. Louis Railway Company, the lessee:

Horace Scott, General Superintendent; George S. McKiernan, Auditor; J. H. McCampbell, Cashier, Jeffersonville, Ind.; H. C. Hinman, General Freight Agent, Louisville, Ky.; A. Anderson, General Ticket Agent, Jeffersonville, Ind.; Wm. Mullins, General Purchasing Agent, Pittsburgh, Pa.

Scott, Hinman and Anderson held the same positions under the former management; Campbell was Treasurer of the old company, and Mullins is Purchasing Agent of the "Pennsylvania Company."

The annual meeting of the stockholders of the Cleveland, Columbus, Cincinnati & Indianapolis Railroad Company was held in Cleveland, March 6. The following were elected directors for the ensuing year: L. M. Hubby, Oscar Townsend, H. B. Hurlbut, Selah Chamberlain, S. Williamson, T. P. Handy, S. Witt, Wm. Collins, Cleveland; Horace F. Clark, Augustus Schell, New York; J. Miller, Columbus, O.; John W. Burson, Muncie, Ind.; Robert M. Shoemaker, Cincinnati. There were but two changes in the directory from the previous year, Robert M. Shoemaker, of Cincinnati, President of the Cincinnati & Springfield Railroad Company, was chosen to fill the vacancy caused by the death of George Worthington, and Stillman Witt in place of Amasa Stone, Jr. The following officers were all unanimously re-elected: President Oscar Townsend; Vice-President, H. B. Hurlbut; Secretary and Treasurer, George H. Russell.

A recent reorganization of the New Jersey Southern Railroad Company has been effected and the directors now are: George M. Bartholomew of Hartford, President; George B. Upton, Chas. W. Huntington, Thos. H. Perkins, Boston; George L. Dunlap, Chicago; A. W. Greenleaf, Stephen V. White, George W. Bentley, New York; Ashabel Green, Benjamin Williamson, Courtland Parker, John P. Stockton, Benson Van Vliet, New Jersey.

At a meeting of the Lake Erie, Evansville & Southwestern Railroad Company, held at Evansville, Ind., on the 7th inst., the organization of the consolidated company was completed by the election of the following board of directors: Messrs. G. N. Carleton and Hiram D. Franklin, New York; John J. Chandler, Evansville, Ind.; Robert Pattison, Seymour, Ind.; Gov. Will Cumbach, Greensburg, Ind.; Judge Albert Haines, Eaton, O.; W. H. H. Dye, Troy, O.; Isaac N. McBeth, Bellefontaine, O.; and James A. Coo, Boston. At a subsequent meeting of the directors G. N. Carleton was elected President, John J. Chandler, Vice-President; Albert G. Richardson, Treasurer, and Horace M. Carleton, Secretary.

Mr. Charles F. Hatch, for some years General Superintendent of the Lake Shore & Michigan Southern Railway, an active, energetic and decisive manager of great skill, has been chosen by the directors of the Eastern Railroad Company of Massachusetts to be General Manager, having, it is understood, intrusted to him many of the duties formerly performed by the President. Mr. Prescott, we understand, will remain General Superintendent.

S. A. Hodgman, at present Assistant Master Mechanic of the Philadelphia, Wilmington & Baltimore Railroad, has been appointed Superintendent of the Wilmington & Western Railroad, the appointment to take effect on the 1st of April.

OLD AND NEW ROADS.

Toledo, Ann Arbor & Northern.

The contract for grading has been let to Crane & Thompson, of Litchfield, and work is to be commenced as soon as the frost is out of the ground. Right of way has been secured for 24 miles, and depot ground in several towns. A strong effort will be made to extend the road to East Saginaw.

Milwaukee & Northwestern.

This is the title of a new company which desires to construct a railroad from Milwaukee northwest directly to Fond du Lac. Milwaukee has been asked to subscribe \$75,000 to the common stock, but refused. Already trains are running through between Fond du Lac and Milwaukee, by way of the Sheboygan & Fond du Lac and the Milwaukee & Northern.

Wisconsin Central.

The *Jamesville Gazette* says: "Captain Edward Ruger, of this city, has been employed by the managers of the Wisconsin Central Railroad as Chief Engineer of their road; and to construct an extension which they have determined to build at once from Geneva in this State to Elkhorn, Whitewater and Jefferson, and ultimately to Columbus."

The *Portage Register* says: "Some delay has been occasioned in the execution of the bonds of Grand Rapids, but they have now been signed and will be deposited forthwith with the Secretary of State, in escrow—\$50,000 to be delivered when the road reaches the southern boundary of Wood County, and the other \$50,000 when it reaches Grand Rapids, and the time for the completion of the road extended to December. Large numbers of ties for the road are being accumulated at various points on the road and on the banks of the Wisconsin River."

The Mauch Chunk "Switch-back."

The *Mauch Chunk Gazette* says: "The road will be improved in many ways. Heretofore it has been used to transport coal, and the passenger traffic has been incidental. Now the coal will be shipped via the Nesquehoning Tunnel to Mauch Chunk, and the Switch-back will be refitted and used almost exclusively for tourists, and pleasure-seekers generally. It is the purpose of the gentlemen having the road in charge to build an elegant pavilion upon the top of Mount Pisgah. Here the tourist can stop and enjoy the magnificent view which the stupendous elevation affords. Refreshments of all kinds will be served in the best style. Walks will be laid out, and the rocky places will be made beautiful. The idea

of a pavilion on Mount Pisgah is a good one. Heretofore travelers have only had a few minutes to view the scene from the top of the mountain. Under the arrangements proposed, they can stay all day if they like. The new coaches will be totally unlike those now in use. They will be furnished with revolving chairs instead of the present style of seats, and will be much more handsomely made. We understand that trains for the top of Mount Pisgah will be run every few minutes, while trains to Summit Hill will leave the pavilion every hour."

Milwaukee, Manitowoc & Green Bay.

The rails are laid on this road from Sheboygan south near the lake shore for 15 miles, the road-bed is completed and the ties distributed for ten miles further, and the grading completed to Port Washington. The officers promise to have the road opened to Milwaukee by the 1st of July and to Manitowoc by the close of navigation next fall. Its heaviest grades are 50 feet to the mile, which, for a shore line, are heavy. The cost of grading is said to be but \$3,000 per mile. The Milwaukee & Northern road is nearly parallel with it as far as Sheboygan and from there to fourteen miles further west. The officers are Joseph Vilas, President; Wm. Elwell, Superintendent; H. G. H. Reed, Superintendent, all of Sheboygan. The company controls the Manitowoc, Appleton & New London road.

The Pennsylvania in Virginia.

The *Richmond Whig* of the 13th says:

"Twelve months ago we had a great row here with the Pennsylvanians. They came here, and, as was rumored, 'bought right through' a bill for a charter for a road from Washington to Richmond. On the 4th instant this charter expired by the terms of the bill—none of the conditions being complied with. One of the conditions required that \$12,000 a mile should be expended on the Norfolk & Great Western, and the same amount on the Washington & Piedmont road. There were other conditions in respect to the Fredericksburg road. All these conditions required money and were unsavory to the disinterested gentry from Philadelphia. They, therefore, unblushingly forfeited all their pledges, when the bill was passed, and have wholly failed to fulfill a single promise they made. They now have the face, it is said, to ask the Legislature for another charter. Their first expedient was a free railroad law; but that being understood, fell still-born. Their next was the law which was sneaked through the last Legislature to authorize circuit courts to grant charters within a county. This law was yesterday repealed. Nothing now is left them but a direct application for a new charter, to get which will cost a good deal more than it is worth."

Richmond all along has been jealous of proposed roads to the north in the interest of companies which control lines to the south and west, apparently fearing that there will be more traffic taken through Richmond than to it by such lines, which perhaps is true, but will depend chiefly on the attractions which that city can offer for the sale of produce and the purchase of goods there.

Kankakee & Indiana.

A contract for the construction of this railroad has been awarded to M. C. Ott, of Chicago. It is to extend from Kankakee, Ill., south by east about 12 miles to St. Anne, on the Chicago, Danville & Vincennes road and at the northern terminus of the Cincinnati, Lafayette & Chicago road. It will give the latter a connection with the Illinois Central.

Denver Pacific.

Referring to the recent closer alliance of this road with the Kansas Pacific, the *Denver News* says:

"Under Governor Evans' administration the Denver Pacific has been managed in the most judicious and economical manner possible; yet it labored at a great disadvantage, and it was only by the closest scratching that it could be made to meet current expenses. Run in connection with the Kansas Pacific, it cannot fail to do better, and the successful career of General Carr, heretofore, will be ample assurance to the public of its good management in the future."

Julesburg & Denver.

The Laramie correspondent of the *Denver News* says that it has been determined to construct, in the interest of the Union Pacific, a narrow-gauge railroad from Julesburg to Denver, in place of the proposed line from Pine Bluffs. The correspondent says: "This has not only been determined upon, but the money has been raised to build the road at once. Mr. Oakes Ames subscribed for one-tenth of the stock. Mr. Sickles has instructions to commence the work immediately. The road will run on the north side of the South Platte through as fine a country as there is in Colorado to the mouth of the Cache-la-Poudre, either at Greeley or Evans; thence through the coal fields of Boulder Valley to a close connection with the Denver & Rio Grande Railway. The road will be two hundred and sixteen miles long."

Baritan Bridge.

The decision which authorizes the construction of this bridge will, it is reported, secure the early completion of a connection of the Central of New Jersey with Long Branch, so that resort will be no more than an hour's ride from New York.

Rutland Railroad.

The *Springfield Republican* reports as follows the proceedings of the stockholders' meeting in Rutland on the 13th inst., when the investigating committee reported upon the affairs of the road: "The light thrown upon the subject by this committee only serves to render the darkness more visible. They place the liabilities at \$1,720,721 and the assets at \$422,187, the latter sum about one million under the recent estimates of Governor Page. The debt to be provided for, instead of being a quarter of a million, as Governor Page made it, is one million and a quarter. The committee advise the rejection of the plan to extinguish the floating debt directly with the annual income, as it would take too long and the interest upon the floating debt is too high, averaging three per cent. They would also reject Governor Page's plan to increase the preferred stock to \$5,000,000, which would furnish only

\$700,000, and besides be of doubtful legality. They recommend an issue of \$1,500,000 in bonds, to be secured by a first mortgage on the road, station houses, machine-shops and property of the company now under lease to the Vermont Central and Vermont & Canada railroads, exclusive of the rolling stock already mortgaged for the payment of \$500,000 7 per cent. and \$500,000 8 per cent. equipment bonds, and the steamboat property, which bonds shall be redeemable in 30 years and bear 8 per cent. interest payable semi-annually, free of government tax, in the city of Boston, and to be issued with 'coupons' or 'registered,' as subscribers may desire, not to be issued or sold at less than par, and the proceeds to be used exclusively for the payment of the present indebtedness of the company and the interest thereon, the bonds first to be offered to the stockholders pro rata; and they recommend that the directors of the company be instructed to apply to the Legislature of Vermont, in October, 1872, for such an amendment to the charter of the company as will enable the corporation to legally make and execute such a mortgage. After a long discussion, this plan was rejected and one proposed by Gov. Page adopted, with comparative unanimity. In accordance with the latter plan, the recent authorization of a 7 per cent. bond was rescinded, and it was voted to issue 8,524 shares of preferred stock at par to holders of preferred and common, one of the new to every six of the old; and also 1,476 shares of the Addison Railroad; also voted, that if this stock fails to be taken, the plan of the committee shall be adopted."

Indiana & Illinois Central.

This railroad, which has had a little work done on it, but has for some time been involved in difficulties, is now, it is reported, being put under contract. Its route is from Indianapolis due west to Decatur, Ill., about 150 miles, through a country for most of the distance very fertile, but already pretty well provided with railroads. The contract for the construction of the section in Illinois was let on the 13th inst. to C. A. Manners & Co.

Toledo, Wabash & Western.

This company in 1871 delivered in Toledo more than 15,000,000 bushels of grain; and its business this winter has been limited only by the capacity of the Toledo elevators for storage and of the Lake Shore road for moving the grain eastward.

Iowa Railroad Earnings.

The laws of Iowa compel each company operating a railroad in that State to file annually with the State Treasurer a sworn statement setting forth the amount of gross receipts of their railroad for the year ending the 31st of December preceding as well as the number of miles of main track in each county crossed by it. In this return the Treasurer levies a tax of 1 per cent. on the first \$3,000, or part thereof, per mile; 2 per cent. when over \$3,000 and under \$6,000; and 3 per cent. on the excess of receipts over \$6,000 per mile. Four-fifths of the taxes thus collected are distributed among the several counties through which the roads run, in proportion to the number of miles of main track in each county; the other one-fifth goes into the general revenue of the State. All the companies, except one, have now made their annual returns to the Treasurer, and their report is subjoined:

Name of Company.	Gross earnings.	
	1870.	1871.
Chicago, Iowa & Nebraska	\$1,320,822 32	\$290,495 75
Burlington & Missouri River	2,156,767 20	2,546,477 83
Chicago, Rock Island & Pacific	2,227,537 17	1,975,702 98
Chicago & Southwestern	13,108 43	183,450 00
Des Moines Valley	803,835 22	771,962 42
Dubuque Southwestern	190,747 87	163,176 04
Keokuk & St. Paul	134,555 59	152,287 57
Milwaukee & St. Paul	906,814 06	808,295 46
Kansas, St. Joseph & Council Bluffs	277,312 00	284,707 22
Dubuque & Sioux City	1,185,623 92	945,277 37
Iowa Falls & Sioux City	141,672 41	282,277 90
Cedar Falls & Minnesota	141,100 98	121,146 08
Sioux City & Pacific	236,733 85	152,824 09
Sabula, Ackley & Dakota	321 00	12,215 59
Davenport & St. Paul	7,588 72	61,127 13
Iowa Midland	3,734 23	53,428 59
Central Railroad of Iowa	103,354 17	420,745 49
St. Louis & Cedar Rapids	56,277 89	85,596 29
Burlington, Cedar Rapids & Minnesota	172,905 20	409,472 33
Cedar Rapids & Missouri River	1,256,167 08	1,379,546 55
Des Moines & Indianapolis		2,330 63
Total.	\$11,932,352 94	\$11,769,630 31

New Bonds in the Stock Exchange.

The committee on stock list of the New York Stock Exchange has recommended that the first mortgage 7 per cent. bonds of the Lafayette, Bloomington & Mississippi, the Pekin, Lincoln & Decatur, and the Hannibal & Central Missouri, and the second mortgage 7 per cent. bonds of the latter company be placed on the free list. All are leased to the Toledo, Wabash & Western, and the bonds guaranteed by it.

It also recommends that first-mortgage 7 per cent. bonds of the Cincinnati, Lafayette & Chicago Railroad Company and first-mortgage registered 7 per cent. bonds, first issue, May and November, the first-mortgage registered 7 per cent. bonds, second issue, January and July, and the first-mortgage registered 7 per cent. bonds, third issue, January and July, of the Delaware & Hudson Canal Company, be placed on the free list.

Jersey City & Camden Narrow-Gauge.

The bill granting a charter for this railroad has been defeated in the New Jersey Legislature.

United Railroads of New Jersey.

The New Jersey Legislature has passed a bill authorizing the consolidation of these roads, reducing the number of directors to 13, and giving the State but one instead of two.

Vermont Central.

This company uses monthly, at its St. Albans shops, 400,000 feet of timber in the construction of cars. The flat cars are made chiefly of chestnut brought from Connecticut.

Eastern Railroad.

This company, it is reported, has paid Mr. Alice H. Cheney, of Newburyport, \$8,500 for injuries received at the Revere disaster, and the only child of Mrs. Susan H. Cheney, who was killed, has received \$5,000. William

Lloyd Garrison, Jr., has brought suit against the company for \$30,000. Evidently the accident will prove costly as well as terrible.

Great Western of Canada.

This company's ferry steamer "Great Western," which is used for transferring cars from Detroit to Windsor, during the year 1871 made 10,008 trips and transferred 111,680 freight cars, besides passenger cars and occasionally a locomotive. This is an average of 306 freight cars daily, most of which must have passed over the entire main line from Windsor to Suspension Bridge.

Omaha & Council Bluffs Bridge.

This new bridge was tested on the 13th inst. with a locomotive and ten flat cars loaded with stone, each car weighing 30 tons with its load. The test is reported entirely satisfactory. The bridge is not open for use yet, partly because the approaches are not quite complete, and partly because of a conflict of opinion as to whether the eastern roads shall run their trains over it to Omaha, or the Union Pacific its trains to Council Bluffs.

Erie Railway.

A correspondent of the New York Times calls attention to the obstacles to economical operation offered by the heavy grades of this road, one of which, from Port Jervis to the summit of the Shawangunk Mountains, is at the rate of 75 feet per mile for twelve miles, and another, from Greycourt to the summit between Monroe and Oxford, is 80 feet per mile for three miles, and both are against the heavy traffic. These grades alone, according to the ordinary engineers' estimate, require for the 15 miles motive power equivalent to that required for 57 miles of level track. It is reported that easier grades can be found on a line further south; but in calculating the gain for a new line, it should be remembered that it would be by no means level, and that motive power is but one item in train expenses.

Niagara Suspension Bridge.

The St. Catharines Journal says: "It is the design of the Board of Directors of the Niagara Railway Suspension Bridge to make extensive repairs upon the bridge during the coming season. Lumber and other needed materials are now accumulating for that purpose. So soon as favorable weather will permit, workmen will be sent to the top of the towers, for the purpose of lifting off the iron covers so that they can readily see the condition the wires in the cables are in, as they have not been disturbed since they were put in place twenty years ago."

New Jersey Midland.

This company has purchased a tract of land at Hoboken, along the Hudson, from Thirteenth to Seventeenth streets, where, it is said, it will have a terminus and a ferry.

Milford & Matamoras.

Two or three years ago this company, which had long had a charter for a railroad from Matamoras, Pa. (on the Delaware opposite Port Jervis, N.Y., on the Erie Railway), down the Delaware River to Milford, about ten miles, obtained the passage by the Pennsylvania Legislature of a curious law which appropriated the \$10,000 paid annually to the State by the Erie for right of way through Pike and Susquehanna counties, to the new company for 99 years. The road was put under contract and work commenced last fall and completed in December; but the Governor of Pennsylvania has pronounced unconstitutional the law providing for the State subsidy of \$10,000 and directed the Erie Company to pay the sum into the State Treasury as before. He also presented the matter to the Legislature, which repealed the law.

Walkill Valley.

A correspondent of the New York Times describes as follows a bridge built for this road across a gorge in the Shawangunk Mountains, through which flows Rondout Creek, at Rosendale, N. Y.: "The bridge is a diagonal truss, Post's patent. There are three iron spans and two wooden ones. The entire length of the bridge is 983 feet, the iron spans being 876 feet, and each of the wooden ones 56. It is 150 feet above the Rondout Creek. In putting up the iron work three hundred thousand feet of timber were used, it being necessary to put it up for each span at a time. One thousand tons of iron were used in the construction, and its supporting capacity is four thousand pounds to the lineal foot. For the stringers, cross pieces, etc., 120,000 feet of timber were required. The structure is the highest span bridge in the United States. It cost \$125,000. The rails will be laid over it next month."

This bridge was built by the Watson Manufacturing Company, of Paterson, N. J., A. L. Dolby & Co. having the contract for the excavations and abutments.

The Leavenworth Bridge.

The last iron of the last span was put in place on the afternoon of the 13th, the work now is in painting and putting down the track and flooring, and by the 1st of April it is expected that the bridge will be ready for the first train to cross.

St. Croix & Superior.

Walbridge Bro. & Sargent, who are constructing the line from Superior to the junction of the Lake Superior & Mississippi and North Pacific, which is being built under this company's charter, have about 300 men at work on the line and are trying to get 500 more. Much of the grading is in sand.

Alabama & Chattanooga.

Judge Buseed of the United States District Court, sitting in bankruptcy on the 13th inst., granted an order for the sale of the Alabama & Chattanooga Railroad, subject to every lien of the State of Alabama for the indorsements of the bonds of said railroad and for all interest paid by the State on indorsed bonds. The sale is ordered for the 23d of April by the assignees. On the previous day Judge Hill, of the United States Court at Mobile, appointed Charles Walsh, of Mobile, receiver of the road in Mississippi, he being already receiver in Alabama. L. J. Fleming, General Superintendent of the

Mobile & Ohio Railroad, is superintending the operation of the road. It is expected that arrangements will be made with the receiver in Georgia by which the road will be put under the management of Mr. Fleming for its entire length, which is very much to be desired.

Denver, Georgetown & Utah.

This company, organized some time ago, filed its articles of incorporation with the Secretary of Colorado Territory on the 12th inst. Its purpose is declared to be to construct and operate a railroad and telegraph from Denver westward through Idaho and Georgetown to the west line of the territory "to secure the best practicable transcontinental line from the Atlantic to the Pacific ocean," with a branch to Black Hawk, Central City or Nevada, and other branches to mines near the line.

At a recent meeting of the incorporators Robert E. Carr (President of the Kansas Pacific) was chosen President, John D. Perry (director and late President of the Kansas Pacific) Vice President, R. R. McCormick, Secretary, and D. H. Moffatt, Jr., Treasurer. John D. Perry was commissioned to arrange terms with Clear Creek County for the road from Denver to Georgetown and the voting of \$200,000 of the county's bonds.

Sioux City & St. Paul.

This new road has been closed by snow for some time, it being not yet prepared for snow blockades. The Mankato Review says: "The cuts are compactly blockaded, rendering snow-plows entirely useless, and have to be chopped and shoveled out in cakes as if a solid mass of ice. In places drifts are as high as the telegraph poles, and occasionally covering the wires."

Pacific of Missouri.

Edwin Harrison, executor of the estate of James Harrison, deceased, has brought suit against this company in St. Louis for \$139,925, which he claims is due for services in raising money and securing for the company the purchase of \$5,000,000 of Missouri State securities to pay off the mortgage lien of the State on the company, and for negotiating the sale of \$6,500,000 of the company's bonds.

North Shore of Canada.

This company has accepted the proposal of P. H. Smith and Samuel S. Keith and their associates to construct the North Shore and also the Piles Railway for \$7,000,000, of which one million is to be in Quebec city bonds and six millions in land and road bonds, the road to be of standard (4ft. 8½in.) gauge, first-class in construction and equipment, and to be begun this spring.

Michigan Air Line.

The Detroit Tribune says:

"A letter has been received in Port Huron from the President of the Air Line Railroad Company, in which that gentleman says that it was the original intention of that company to make Port Huron the eastern terminus of their line, and that they still desire to do so. The bend of the road from Armada to Ridgeway was merely a temporary arrangement to afford a connection with the Grand Trunk road. It is also reported in St. Joseph County that the Canada Southern has entered into arrangements with the Air Line Company which will secure the construction of that portion of the Air Line road between Jackson and St. Clair, at which point it will connect with the road eastward through Canada. When that is finished, the company will seek a route from Jackson & Chicago and westward, and it is proposed to make the Centreville & State Line Railroad a part of that route. The proposition which is made to the people along the line, and which is certainly favorable, and certainly without risk, is that the right of way be secured, and a subscription equal to \$3,000, or a subscription of \$4,000 per mile, and the company will undertake to secure the right of way and construct the road."

Winona & St. Peter.

It is reported that this company has commenced surveys for a branch line from Rochester, 50 miles west of Winona, northward to St. Paul, which is the line on which the Davenport & St. Paul is expected to build.

Milwaukee & Dubuque.

The city of Milwaukee is to vote on the 2d of April on a proposition to subscribe \$50,000 to extend the Monroe Branch of the Milwaukee & St. Paul Railway from Monroe, Wis., to Dubuque.

Union Pacific.

It is reported that arrangements have been made whereby passenger cars are to run through between St. Louis and San Francisco via Omaha and the Union Pacific Railroad.

The report that the motive power of the company was in large part destroyed during the snow blockade is denied. A very large number of engines were disabled temporarily, but in most cases comparatively light repairs is all that they need. The company's officers say they are confident that without extraordinary cost they will be able to provide in future against the severest snowstorms. The peculiarity of last winter's storm was the packing of the snow by the winds, until it was nearly as hard as ice, when snow-plows had very little effect upon it, until trenches had been dug through to the rails at short intervals.

Missouri Pacific.

Beginning with the 1st inst., this company added one regular through passenger train, and now has three trains daily between St. Louis and Kansas City, leaving St. Louis at 8:25 a.m., 5:30 p.m. and 11:15 p.m. On the first, a day and Pullman sleeping car and baggage car run through Kansas City and St. Joseph to Council Bluffs, connecting with the Union Pacific train, and others run through Kansas City and Atchison to Leavenworth. On the second, day and sleeping cars run through to Lawrence and to Atchison; and on the third, day and sleeping cars run through to Fort Scott and Parsons, as well as to Kansas City, running over the Sedalia Division of the Missouri, Kansas & Texas Railway from Sedalia to Parsons. These give the Missouri Pacific additional connections of great value which should materially increase its traffic. The company's passenger stock is exceedingly good, the cars

being equipped with the Miller platform and the Goodale steam brake, and Pullman sleeping cars being run on night trains.

Cincinnati & Terre Haute.

It is reported that the first spike was driven on this road at a point four miles southeast of Terre Haute, on the 14th inst.

St. Croix & Superior.

The House of Representatives has voted squarely against renewing the land grant in this company, adopting a substitute to the effect declaring the lands all forfeited to the United States, and reserving them for entry under the homestead act; but probably this will make a committee of conference necessary, and it is reported that the company feels confident of success after all.

Indianapolis, Bloomington & Western.

The offices of the General Freight Agent, H. C. Diehl, and the General Passenger and Ticket Agent, John W. Brown, have been removed from Urbana, Ill., to Indianapolis.

Cincinnati Railroad Bridge.

The railroad bridge over the Ohio from Cincinnati to Newport is completed, and the first train passed over it on the 14th inst.

New York Central & Hudson River.

This company has declared the usual half-yearly dividend of 4 per cent. on its stock and scrip, payable on the 15th of April, until after which day the transfer books will be closed.

Baltimore & Ohio.

Judge Dobbins, of the Superior Court of Maryland, has decided that this company should have paid the interest on the State loan in gold instead of currency, which means that the company owes the State \$281,489.39—which the Baltimore & Ohio can pay without feeling it.

Lehigh Valley.

The directors of this company on the 12th inst. determined to increase the capital stock by one third by permitting stockholders to subscribe at par for one new share for every three old ones. The payments, however, are to be on exceedingly easy terms, being \$3.75 quarterly for three years and a thirteenth payment of \$5 in April, 1875, to complete the \$50 which is the par value of the shares. As the company pays 2½ per cent. quarterly on its shares, the income from the old shares will just pay for the new ones. Dividends will be made only for the amount paid on the new shares; but they can be paid in full on subscribing, if desired; and as 10 per cent. shares are good things to have, it is not probable that many subscribers will prefer to make their payments quarterly.

The company has secured authority from the New Jersey Legislature, which will enable it to complete an independent line from Easton to Jersey City, with a branch to Perth Amboy.

State Line & Missouri River.

Articles of association of this company have been filed with the Secretary of State of Missouri. It is intended to construct the railroad from a point on the Iowa line, in the northern part of Harrison County, in Missouri, in a southwesterly direction through the counties of Harrison, Worth, Gentry, Davies, Dekalb, Clinton, Clay, Platte and Buchanan to a point on the Missouri River in Buchanan County; the length of the road being 120 miles; amount of capital stock, \$2,000,000, to consist of 20,000 shares. First board of directors are as follows: C. E. Perkins, Burlington, Iowa; David Renick, Pawnee City, Nebraska; James D. Wright, Chariton, Iowa; S. H. Mallory, Chariton, Iowa; J. L. Young, Leon, Iowa; Joseph Truax, Osborn, Mo.; David J. Houston, B. thany, Mo.; Horace Fitch, Eagleville, Mo.; Edward A. Temple, Chariton, Iowa. Two of these are officers of the Burlington & Missouri River Railroad, and the description indicates that the line is intended to be an extension of the Chariton & Leon Branch of that road, to Kansas City, Leavenworth or St. Joseph, or to all.

Chesapeake & Ohio.

It is reported that steel rails will be laid on the 110 miles of the Green Brier and New River divisions, where a heavy mineral traffic is expected, as it connects iron ore deposits with the Kanawha coal fields.

Lynchburg & Danville.

This company is about to begin the excavation of a tunnel at the Lynchburg terminus, to be completed in three months.

Atlanta & Richmond Air Line.

On the eastern end of this road track is laid from Charlotte, N. C., southwestward to the Catawba River, about nine miles, and the road-bed is nearly ready for the rails as far as Spartanburg, S. C.

Valley Railroad.

The Chief Engineer has been directed to contract for the construction of the 26 miles of the road from Harrisburg, the present southern terminus of the Baltimore & Ohio line, southward to Staunton, on the Chesapeake & Ohio, and, very soon, for the heavy work south of Staunton. The right of way for 42 miles has been secured: James L. Randolph, of Baltimore, is Chief Engineer, and Sheffey & Bumbgardner, of Staunton, Va., attorneys.

Flint & Pere Marquette.

A correspondent says: "This road is rapidly gaining an enviable position among the first class Western roads. The company first showed signs of life by completing a road from Saginaw to Flint, a distance of 34 miles. They operated this about three years, when, in 1869, they purchased the Flint & Holly road, 16 miles. In the meantime they had gradually extended their line northward from East Saginaw, so that the purchase of the Flint & Holly road gave them 77 miles in operation. They have now reached southward to Monroe and northward to Reed City. The road will be completed from the latter place next year to Lake Michigan, a distance of 48 miles, which will

give the company control of an aggregate of 287 miles of road. The road was built and operated from East Saginaw to Flint under the superintendence of Dr. H. C. Potter. The Flint & Holly road was under the superintendence of Mr. Geo. C. Kimball, a man of large experience in the New England States. After the purchase, Mr. Kimball was appointed General Superintendent; Dr. H. C. Potter, Secretary and Treasurer; Sanford Keeler, Master Mechanic; and W. B. Sears, Chief Engineer. A 60 lb. rail is laid on 2,640 ties to the mile and everything connected with the track is of a substantial character. The rolling stock is first-class. The sleeping cars are heated by steam, which is not only comfortable but safe in case of an accident which would upset the ordinary coal or wood-burning stoves. The Westinghouse air brake is used and approved on this road, and the entire equipment will bear comparison with that of any other road in the country. No useless brass, but everything is in good taste, which cannot be said of many roads.

"The locomotives on this road are mostly from the Taunton Locomotive Works, which is a sufficient guaranty for their good behavior.

"The principal shops of the company are located at East Saginaw, and are well kept, neat and tidy. Although they are not doing a very fast business, the repairs are well kept up and the car shop turns out one car a day. Altogether the Flint & Pere Marquette is a pleasant road to take a look over. Instead of 'piling on agony' they keep things snug and 'ship shape'; no old trash lying around under foot. They look as though they expected company every day, in every department."

Springfield, Carrollton & St. Louis.

This company filed articles of incorporation with the Illinois Secretary of State on the 15th inst.

Litchfield Car Manufacturing Company.

Articles of incorporation of this company, which is to use the old shops of the Indianapolis & St. Louis road at Litchfield, Ill., were filed with the Secretary of State of Illinois on the 15th. The capital stock is \$100,000.

Arkansas Central.

The President, Colonel S. W. Dorsey, has telegraphed from London that he has placed the first mortgage and State aid bonds of this company, so that its road may be completed with little delay.

Davenport & St. Paul.

The track has reached a point about two miles south of Hopkinton, Iowa, and the iron is now exhausted. A further supply is expected in a few weeks, when the extension will be completed. John Hornby and Moody S. Kimball have been the contractors for laying the track and have put down, so far, about 100 miles.

Framingham & Lowell.

Since the opening of this railroad last September the freighting business has increased from five full cars daily northward to one hundred and seven at this date per day, and should the business continue to increase in the same ratio the next six months, the corporation will be obliged to have increased facilities by adding another track. The opening of this line has brought newly all the leading manufactures in New England more directly in communication with New York and all the principal cities in the far West. The business thus far has exceeded the expectations of all parties interested in the enterprise.

Flint River Railroad.

This Michigan railroad has been placed under contract, to be ready for operation to Otter Lake in September.

Chicago & Michigan Lake Shore.

Of the \$29,000 of local subscriptions asked to secure the extension of this road from Pentwater north to Ludington, about \$23,800 has been received.

Grand Rapids & Newaygo.

Iron for this road is arriving, and it is reported that it will be completed by June.

Saginaw Valley & St. Louis.

Holcomb & Evans, of St. Louis, Mich., have taken a contract to chop and grade four miles of this road, from St. Louis eastward.

Houghton & Ontonagon.

It is reported that this company has sold its franchises to the Marquette & Ontonagon Company.

Mobile & Montgomery.

The extension of this railroad across Tensas and Mobile rivers, involving two very large and several smaller bridges, and a large amount of trestle-work and heavy embankments, has been completed, and trains now run regularly into Mobile.

Long Island Central.

This road (A. T. Stewart's), which has track laid for a few miles, but has not its connection with the Flushing & Northside road completed, a heavy rock-cut delaying the work, is to be completed this season to Babylon.

Flushing & Northside.

This company has recently completed a second track from its western terminus at Hunter's Point to Woodside, three miles, and is now engaged in constructing a short line, cutting off a bend in the road from Woodside to Bridge-street station, in Flushing, which will be about three miles long and save nearly a mile in distance.

Louisville & Nashville.

It is proposed to construct a branch of this railroad to reach salt, iron and coal deposits in Madison and Estill counties, Ky., which are 20 miles or so north of the eastern branch of the road.

Marietta & Pittsburgh.

This road traverses throughout its entire length a mineral district. Along it are some of the most important coal deposits of Ohio, and a deposit of "black band" iron ore lies upon this line. The main line extends from Marietta, on the Ohio River, to Canal Dover, where it is to connect with the Cleveland & Pittsburgh and the Lake Shore &

Tuscarawas Valley railroads (the latter now in progress). Its proposed northwest extension through Coshocton to Mansfield will open a shorter direct route from the coal field of Eastern Ohio to the Northwest. Thirty-five miles of this road is now completed, and the whole main line, to Canal Dover, is to be completed during the present year.

Baltimore & Potomac.

On the 15th inst. Thomas A. Scott appeared before the House Committee on the District of Columbia, in the Capitol at Washington, to argue in favor of authorizing this road to lay a track and run trains to Sixth street and Pennsylvania avenue, and build a passenger depot there, the ground being government property. John W. Garrett appeared and argued against him. A correspondent writes:

"Colonel Scott informed the committee that he did not wish to have any controversy with Mr. Garrett, or to interfere with his plans for benefiting the people of Washington. All he asked was permission to erect his depot on the site indicated. Mr. Garrett might erect as many depots as he pleased."

Cannon River Railroad.

This company has recently been organized in Minnesota to construct a railroad from the Mississippi at Red Wing west by south to Mankato, about eighty miles. The following organization has been effected: Directors—Hon. J. F. Meagher, Mankato; Hon. James A. Wiswell, Mankato; Hon. L. Z. Rogers, Waterville; Hon. L. Nutting, Faribault; T. B. Clement, Esq., Faribault; Hon. L. F. Hubbard, Red Wing; W. P. Brown, Esq., Red Wing. Officers—President, J. F. Meagher; Secretary, L. Z. Rogers; Treasurer, L. F. Hubbard. The "Slack Water Navigation" swamp land grant of 300,000 acres has been transferred to this company.

Milwaukee & St. Paul.

This company, it is reported, is preparing to build a permanent bridge across the Mississippi between La Crosse and La Crescent, a work which will be almost indispensable when its road from Winona to La Crescent is completed.

Missouri, Kansas & Texas.

The track of the Cherokee Division is now completed as far south as the North Fork of the Canadian River.

Wyandotte, Kansas City & Northwestern.

This company has been organized for the purpose of constructing a railroad from Kansas City northwestward to Lincoln, Neb., passing through Oskaloosa, Grasshopper Falls, Holton and Seneca in Kansas. A preliminary survey is to be made at once.

Cleveland & Pittsburgh.

It is reported that the Pennsylvania Company is preparing to construct a branch of this railroad from Ravenna eastward about 35 miles to Youngstown, O., which is at the northwestern terminus of a branch of the Erie & Pittsburgh Railroad, also operated by the Pennsylvania Company. It would complete a loop line from Ravenna to Homewood.

Cleveland, Mount Vernon & Delaware.

The contract for grading the entire line from Mount Vernon, O., to Columbus has been let to Cassil & Israel, to be completed September 1, and it is intended to have the road in running order before the close of the year.

Sullivan & Roodhouse.

This company, recently organized under the general railroad law of Illinois, purposes to construct a railroad from Sullivan, Ill., nearly due west to Roodhouse, about 100 miles. The principal office is to be at Taylorville, Christian County. Capital stock, \$2,000,000. The following gentlemen were elected officers: Benjamin Dornblaser, President; Lewis Solomon, Vice-President; Wm. T. Vandever, Secretary and Treasurer; James M. Taylor, Attorney. The Board of Directors are: A. N. Smyser, Jonathan Meeker, Skelton Burket, John E. Hunt, James B. Wright, J. R. Pound, Peter L. Myres, R. M. Ballinger, Guy M. Chedister and the officers.

Whitehall & Rouse's Point.

On the 16th inst. articles of association were filed with the Secretary of State of New York, providing for the construction of a railroad from Whitehall to Rouse's Point, Clinton County, a distance of 128 miles, to run along the west shore of Lake Champlain. The capital stock is \$4,000,000. The directors are John A. Griswold, of Troy; C. F. Norton and Andrew Williams, of Plattsburgh; L. V. Baker, of Comstock's Landing; Samuel Ames, of Keeseville; W. W. Cooke, of Whitehall; Abiel A. Lord and L. G. B. Cannon, of New York; George B. Warren, G. H. Cramer and W. A. Shepard, of Troy; Thomas Dixon, of Scranton, Pa.; and Geo. Talbot Olyphant, of New York.

St. Louis, Alton & Terre Haute.

The issue of preferred stock consented to by the shareholders and preferred shareholders will be made to the persons registered as holders of preferred stock at the closing of the transfer books on the 25th instant, at the rate of 21 per cent. of their holdings, in full for all claims in arrears. The books will remain closed until April 20. It is announced that the company owes no floating debt other than the claims provided for by this issue of stock, and it is believed that 7 per cent. dividends may be made hereafter regularly on the preferred stock, of which there is about \$2,000,000.

Baltimore, Pittsburgh & Chicago.

This company, which is to construct the Baltimore & Ohio line from Pittsburgh to Chicago, has filed articles of incorporation with the Secretary of State of Indiana. The capital stock is \$2,000,000. Wm. Keyser, Walter C. Quincy, Geo. R. Dennis, John Gardiner, T. Harrison Garrett, Wm. W. Taylor and John R. Cowen constitute the present board of directors. It is proposed to extend the line from a point on the eastern boundary of Indiana, opposite Delfiance County, Ohio, through the counties of De Kalb, Noble, Kosciusko, Elkhart, Marshall, St. Joseph, Laporte, Porter and Lake, to a point in the

northwest corner of Lake County, a distance of about 145 miles.

Cincinnati & Newport Bridge.

This new railroad bridge over the Ohio was tested on the 19th instant with five locomotives, weighing 130 tons. The deflection on the 400 feet span was one and one-half inches; the other spans varied from one-half to one and one-sixteenth inches, according to the length of the span.

Burlington & Missouri River.

The telegraph reports that five or six ticket agents and conductors have been arrested at Council Bluffs, Iowa, for defrauding the company, and are held to answer the charge of embezzlement before the district courts, and that several employees have been dismissed for the same offense.

Missisquoi & Clyde Rivers.

Grading has been commenced on the Troy and Newport sections of this road, and as soon as spring opens will be pushed rapidly forward. Mr. S. M. Field, the bridge contractor, taking advantage of the ice, which is unusually firm, is driving the piles for the bridge across the bay at Newport, and appearances indicate an early completion of the work.

Montpelier & Black River.

This new road is proposed to run from Montpelier north to Troy or Newport, Vt. A committee has been appointed to make the preliminary survey and obtain a charter. This road would make Montpelier a virtual as well as topographical center of the State, and will open up a rich country.

Green Bay & Lake Pepin.

The contract for grading three miles of the extension, from the present terminus at New London westward to Northport, across a swamp, has been let to Henry Lawrence, and work on it has begun, it being important to complete it while the frost is in the ground and the swamp is accessible. It is reported that the iron has been secured for an extension as far west as Grand Rapids, Wis.

Breaking Rails with a Vengeance.

The Peoria Transcript says that recently a broken driving-wheel on a locomotive ran over twelve miles of the Chicago & Alton Railroad and broke 130 rails before the accident was discovered.

Sleeping Cars with Transferable Trucks.

It is reported that sleeping cars have been planned and nearly completed to run between New York and Chicago over the Erie as far as Buffalo and thence over the standard-gauge North Shore Line. This is to be done by lifting the car bodies from the wide-gauge trucks at Buffalo or Niagara Falls and transferring them to trucks of the standard gauge, exactly as is now done, and has been for many months, with the freight cars of the "Erie and North Shore Line."

Stone Sleepers.

A Kansas paper says that an "extensive manufacture of railroad ties from stone will be commenced at Osage City during the coming season." Some of the earliest railroads had stone sleepers, but they were found too inelastic, and their durability is at the expense of the rails and rolling stock.

ON THE APPLICATION OF ELECTRICITY TO THE REGULATION OF RAILWAY TRAFFIC.

[Paper read before the Society of Practical Engineers, March 13, 1872, by F. L. Pope, Electrical Engineer.]

If we consider steam, the almost universal motor, as the muscle of modern mechanism, we may with equal propriety regard electricity as its brain. The want of success which has attended the numerous attempts which have been made during the past 30 years to utilize electricity as a motive power has served to indicate to the more thoughtful class of inventors that its true function, as applied to machinery, is not that of a prime mover, but rather that of a guiding, controlling and supervising intelligence, almost rivaling that of the human mind itself. Viewed in respect to this, its manifestly appropriate sphere, the number and variety of its probable and possible applications in the future are almost beyond computation. In fact, the cultivation of this vast field can scarcely be said to have fairly been commenced.

I propose, in this paper, to give some account of the progress which has been made in the development of one of the most important of these applications of electricity—that of the supervision and control of the movements of trains upon railroads.

The peculiar fitness of this mysterious agency for this work is at once apparent upon the most casual consideration of the subject. On a railroad whose trains are moved by telegraphic orders, the official who directs their movements is rendered practically omnipresent. He is virtually everywhere at the same time, and he can make his arrangements and carry them out with as much certainty as if every train were within the reach of his vision and within the sound of voice, as he sits at his desk.

The first railroad in this country which provided itself with a telegraph line devoted exclusively to the business of the road was the New York & Erie. A single wire was put up about the year 1850, between Piermont and Dunkirk, which was at first employed merely for the transmission of communications to and from officers, employees, etc. Ordinary public business was also transacted to some extent, as opportunity offered. The idea of its being practicable or safe to employ the telegraph for the movement of trains does not seem to have originally occurred to any of the officers of the road. Upon one occasion, some time during the year 1851, Mr. Luther G. Tilton, who was then Superintendent of the telegraph line, together with the Division Superintendent of the railroad, were in the telegraph office at the depot in Elmira. The express train from New York, though due, was known by means of the telegraph to be about four hours late, and certainly not within a hundred miles of Elmira. An eastward-bound stock train lay on a siding at Corning, 18 miles west, waiting for the express to pass. A westward-bound freight train at Elmira was also waiting for the express. It was no uncommon occurrence for freight trains to be held in this way for hours and even days by belated passenger trains. In fact, it is vouched for as an actual occurrence that a third-class train on the Erie road once lay on a siding at Union station for a whole week before it could get away according to the rules. On the occasion in question, it occurred to Mr. Tilton that the stock train might be ordered to Elmira, and the freight sent forward to Corning, thus saving 36 miles of running time, and the whole operation be completed long before the arrival of the express. But this idea was so utterly without precedent that the Superintendent could not at first be prevailed on to give the order,

even when Mr. Tillotson urged that there could be no possible danger even if the express *did* arrive in the meantime, as it could be detained at Elmira until the arrival of the stock train. Finally it was determined that the Superintendent should detain the express at Elmira, in case it unexpectedly appeared, and also order the freight to go ahead as far as Corning. Mr. Tillotson accompanied the freight train, armed with a written order from the Superintendent, to bring back the stock train, which was accomplished without difficulty long before the arrival of the express.

The success of this experiment was encouraging, and led to the next step, that of transmitting the orders by telegraph to the conductors of the trains. After this had been done a few times without accident, Mr. Tillotson suggested, as a further precaution, that each conductor receiving an order for the movement of his train should telegraph back his understanding of the order before being allowed to execute it, which was accordingly established as a rule. This was the origin of the American system of train dispatching, which was first adopted on the Susquehanna Division of the Erie Railroad, and soon after on the entire line. The credit of its general adoption upon the Erie road is due to the late Charles Minot, who was then General Superintendent. To those familiar with the history of such improvements, it is almost superfluous to state that the most strenuous efforts were made to prevent its introduction, not only by nearly all the other officers of the road, but by the conductors and engineers, some of whom went so far as to sacrifice their situations rather than to submit to such an innovation as that of running against the time of another train on telegraphic orders. The trepidation and alarm manifested by some of these conservative gentlemen upon the general adoption of the system was a source of infinite amusement to the telegraphic operators.

In his report to the stockholders made in 1855, after the system had been in use for four years, the General Superintendent referred to it as follows:

"A single track railroad may be rendered more safe and efficient by a proper use of the telegraph than a double-track railroad without its aid; as the double track can only obviate collisions which occur between trains moving in opposite directions, while the telegraph may be effectually used in preventing them either from trains moving in an opposite or in the same direction."

"I have no hesitation in asserting that a single-track railroad having judiciously located turn-outs, equal in the aggregate to one-quarter of its entire length, and a well-conducted telegraph, will prove to be a more safe and profitable investment than a much larger sum expended on a continuous double-track operated without a telegraph."

"In moving trains by telegraph, *nothing is left to chance*. Orders are communicated to the conductors and engineers of the opposing trains, and their answers returned, giving their understanding of the order, before either is allowed to proceed."

"It would occupy too much space to allude to all the practical purposes to which the telegraph is applied in working the road, and it may suffice to say that without it the business could not be conducted with anything like the same degree of economy, safety, regularity or dispatch."

The system having once become thoroughly established upon the Erie road, gradually extended itself westward upon the principal through routes, so that at the present day there are few railroads west of New York, of any importance, which are not operated in this way. Singularly enough, the notorious conservatism of the New England railroad managers has thus far prevented any of them from employing the system at all, with the single exception, I believe, of the Vermont Central road. A vast amount of money might have been saved in some instances, which has been needlessly expended in the construction of a second track through a mountainous and difficult country, many years before it would have become a necessity, had a proper system of controlling the trains by telegraph been introduced.

The general principle on which trains are moved by telegraphic orders, on all single-track roads, is the same; although, as might naturally be expected, considerable diversity exists in regard to the details. It consists, primarily, in concentrating the entire responsibility, as far as practicable, in the hands of one person, who is officially known as the train dispatcher. Through the agency of the telegraph, the train dispatcher, as I before remarked, becomes virtually omnipresent. No irregular engine or train is permitted to move upon the road without his knowledge and his direction, and every train, whether regular or otherwise, is at all times subject to his orders. His authority is absolute, and his instructions must be obeyed fully and to the very letter. He is required to have a thorough knowledge of the rules of the road and their practical working. He must be familiar with the character of the road itself, the location of its grades, the location and capacity of sidings and passing places, the power of the different locomotives, and all the apparently endless details of its operation, in order that he may issue his orders intelligently when an emergency arises. The dispatcher is in all cases an expert telegraphic operator, and during the hours he is on duty sits at the instrument, personally sending and receiving the telegrams by which the movements of the trains are regulated. He has before him a copy of the printed time schedule of the road, on which the different trains are distinguished by numbers, those going in one direction having even numbers, and those going in the other direction odd numbers. He also has a corresponding blank schedule, properly ruled, called the "train sheet," in which the actual time of the arrival, passing or departure of every train is set down as reported by the operators at the stations along the line. In all communications relative to the trains, they are invariably referred to by their distinguishing numbers.

Each station along the line is provided with a colored day and night signal, for stopping trains, placed in a conspicuous position, so as to be seen by the engineer when approaching from either direction, and capable of being managed by the operator without moving from his instrument.

The movements of the trains are theoretically governed by certain rules printed upon the time schedule. Whenever a train fails to make its schedule time from any cause, then the dispatcher takes it in hand. He arranges the meeting and passing points according to circumstances. The telegraphic order is always issued first to the train having the right of the road, and then to the opposing train. When the proper responses are received, the dispatcher replies by a signal signifying "correct," and the trains move forward as directed. If it becomes necessary to stop a through train at some station to await the arrival of an opposing train, an order is issued to the operator to "hold No. —." The operator first turns on his signal, and then replies "No. — is held." When the train in question comes up, the engineer observes the signal and stops until allowed to go forward by the dispatcher.

The amount of time and money saved to American railroads by the use of this system is almost incalculable. Some idea of the extent to which it is used may be inferred from the fact that there were sent from the dispatcher's office of the Michigan Central Railroad at Kalamazoo, during the month of January, 1871, more than 16,000 distinct train orders, or an average of about one order every three minutes, including nights and Sundays!

Three or four years ago, a system differing altogether from the one which has just been described was introduced on the line between New York and Philadelphia, by Ashbel Welch, Chief Engineer of the United Railroads of New Jersey. This line having a double track the entire distance, the danger more especially to be guarded against was that of collision between trains going in the same direction, and the system under consideration was arranged with particular reference to this fact.

On the New York & Philadelphia route telegraphic signal stations are established at intervals somewhat less than the shortest

that are permitted between trains moving in the same direction, averaging perhaps two and a half or three miles apart between Jersey City and New Brunswick. South of New Brunswick, where there are fewer trains, the stations are about five miles apart. Each of these stations is provided with a signal placed where it can be seen as far as possible in both directions. This signal consists of a white board by day and a white light by night, shown through a circular aperture, two feet in diameter, in a black signal box. A partition in the box separates the signals for the opposite directions. The white board or light is ordinarily covered by a red screen. The white or "all-right" signal is exhibited to an approaching train by the operator at the telegraphic instrument pulling a cord. The moment the engine passes he lets go the cord, and the red screen drops by the action of gravity, concealing the white signal.

A special telegraph wire and an operator at each signal station are required by this system. The practical working of it is as follows:

As a train approaches within a quarter of a mile of a signal station the whistle is sounded as a notification to the operator on duty at that point. If he has received word that the preceding train has reached the next station, he pulls the cord showing the white signal, indicating that the line is clear, and the train goes forward. As soon as the last car has passed and he has seen the red flag or light at the tail of the train, he notifies the last station back that the train has passed. Should he not see a red flag or light on the last car it would indicate that part of the train had been uncoupled and left on the road, in which case he telegraphs to headquarters for special instructions.

In the absence of information of the arrival of the preceding train at the next station the operator is not allowed to give the "all-right" signal, and the approaching train is required to stop for explanations or proceed under proper regulations, with the expectation of finding the track obstructed.

In this system reports of the time of passing of each train are telegraphed from each station to the next adjoining one in either direction, and also by a separate wire to the office at headquarters, where it is recorded on a train sheet as in the first-mentioned case.

It will be observed that this arrangement, when properly carried out, affords almost absolute safety. No engineer must pass a station until the white signal is shown. No operator must show the white signal until he has received positive information that the whole of the preceding train has passed the next station. Nor must he telegraph back such information to the last station until he has certainly ascertained that the whole of the train has passed. Nothing is left to chance or to the judgment of the operator or engineer. Two or three plain and simple rules comprise the whole system.

The only objection that can be urged against the general adoption of this system is that of expense. At least two telegraph operators are required at every station, to attend the signals day and night, and the stations on some roads would require to be very numerous. This fact has led to the invention of automatic signals, which are operated directly by the train itself, through the agency of electro-magnetism, requiring no attendance except to see that they are kept in working order.

Other applications of these electric signals have been made for railroad purposes besides that just alluded to, and it may be of interest to state briefly some facts in relation to them. A very large number of devices of this kind have been patented in England during the last twenty years, few of which, however, possess any valuable features.

The first American inventor who seems to have turned his attention to this subject was Thomas S. Hall, who patented, in 1867, an electric signal and alarm bell to be used in connection with a switch or drawbridge. This was so arranged that the displacement of a rail at these points would exhibit a danger signal at a distance of half a mile or more in each direction; while at the same time the bell would ring continually until the track was replaced in its original position, thus certainly attracting the attention of every one employed about the place. This was a good idea, but was wrongly carried out; for by his arrangement a break in the conducting wire or the failure of the battery would render the whole apparatus inoperative, a fact of which no evidence would appear until the moment it was needed. It would obviously be unsafe to depend implicitly upon the indications of a signal which might, under some circumstances, show no sign of danger, even when the switch or draw was displaced. The only alternative was to reverse the plan, so as to keep the electric circuit continuous as long as the track was continuous also, and exhibit the danger signal by the interruption of the current, in which case any failure of the apparatus itself would give a danger signal and call attention to the defect. This plan involves the necessity of keeping the battery in action nearly the whole time, and is therefore attended with much trouble and expense in its maintenance.

A subsequent inventor, Mr. William Robinson, surmounted this difficulty by a very ingenious arrangement, which was patented in 1870. In his plan the circuit is kept continuous at the bridge or switch itself as long as the track is in its proper position, but is interrupted at a point a little in advance of the position of the distant signal. When the approaching train reaches the point just mentioned, its wheels press a lever placed near the rail, and the "safety" signal is exhibited to the engineer, unless the circuit is also interrupted at the switch. If this is the case the signal remains in its normal position, that of "danger," and the engineer governs himself accordingly. The details of this arrangement present some novel features. It will at once be seen that the mere momentary contact of the successive wheels of a rapidly-moving train with the circuit-closing lever would not suffice to make an electrical contact of the necessary duration to raise a signal with certainty. Mr. Robinson therefore uses an electro magnet, so arranged as to keep its own circuit (which is also the signal circuit) closed continuously after contact has once been made, no matter for how brief a period; and this circuit remains thus closed until the train arrives at the switch or drawbridge, when it presses another lever, breaking the circuit, and the signal is released.

The same inventor, in 1870, took out a patent for a signal and alarm to be placed at highway crossings and arranged on a similar principle. When within a suitable distance of the crossing the train was made to press on a lever, closing the circuit and elevating a suitable signal, while at the same time an electric bell was rung until the circuit was broken by another lever at or near the crossing. Some of Mr. Robinson's signals, I believe, have been put in practical use on the line of the Philadelphia & Erie Railroad.

In 1871 Mr. Hall also brought out a crossing signal, worked by levers in proximity to the rail, but differing in the details of its construction. The result produced was similar to that just referred to. Some of these signals were erected at different road crossings on the Hartford & New Haven, New York & New Haven and Flushing & North Side Railroad.

During the past year, Mr. Hall has put in operation a system of automatic electric block signals upon the Harlem Railroad, between the Grand Central Depot, in this city, and Mott Haven Junction. This distance is divided into sections of a mile or more in length, and a signal house is placed between each two sections, the arrangement being analogous to that already referred to in the New York & Philadelphia line. The normal position of each signal is at "safety." When a train passing over the road reaches one of these signal houses, its wheels press upon a lever, closing an electric circuit and exhibiting the danger signal. By a simple mechanical contrivance the circuit is kept closed and the danger signal is displayed until the train reaches the next signal and operates upon that in the same manner. The movement of the second signal is made to close a separate electric circuit, run-

ning back to the one last passed, releasing the latter and allowing it to assume its normal position indicating "safety." A bell is kept constantly ringing in each signal house as long as the signal remains displayed. This is done by a separate battery brought into action by a relay.

The mode of closing an electric circuit by the passing of a moving train, which has been described in conjunction with the inventions of Robinson and Hall, is open to one very serious objection. An express train running at the rate of thirty miles an hour—which is by no means an exceptional rate of speed—moves not less than 44 feet per second. Imagine the effect upon these levers of from thirty to sixty wheels, each of which is a hammer of many tons weight, moving at the rate of 44 feet per second, and this operation repeated perhaps fifty times every day. Any one at all familiar with railroad practice will readily be convinced of the fact that no arrangement of this sort that can be devised will withstand such rough usage for any great length of time.

About a year since, my attention was called to this difficulty of closing the circuit by means of a rapidly moving train, in connection with an improved form of semaphoric signal which had been invented by Mr. S. C. Hendrickson. In seeking to devise some more certain method of accomplishing the desired result, it occurred to me that the rails of the track might in some way be brought into the circuit, so that the connection could be formed by the contact of the wheels of a passing train with an insulated section composed of one or more rails. Several years ago, out of mere curiosity, I had tried the experiment of transmitting electric currents, and, in fact, of telegraphing through the fish-jointed track of the New Jersey Railroad between Elizabeth and Rahway, N. J., with entire success. On this occasion the earth in which the ties were imbedded, as well as the ties themselves, was in a tolerably dry state, and, therefore, afforded a fair degree of insulation, when compared with the great conductivity of the rail, which I roughly calculated to be from 300 to 400 times as great as that of a No. 9 iron wire, such as is ordinarily used in the construction of telegraph lines.

In the fall of 1871, I made a practical test of this method of operating a signal at East Cambridge, Mass., on the line of the Boston, Lowell & Nashua Railroad. A section of track, 42 feet in length, was separated at each end, by an insulated joint, from the adjacent rails of the continuous track in each direction, and a circuit of wires was formed, which included the battery and electro-magnet for operating the signals, the two ends being attached to the respective opposite rails of the insulated section of track. On the passage of a train, the rails became electrically connected by the metallic wheels and axles of the locomotive and cars, and the signal was thrown into position, indicating "danger," to the next following train. The signal was arranged so as to be held in this position by a detent, after the train had passed and the circuit was broken. Upon the arrival of the train at the next station, it closed a circuit at that point in precisely the same manner, and a current was thereby sent from a battery at that station back to an electro-magnet, which lifted the detent of the first-mentioned signal, which allowed it to resume its normal position of safety.

An experience of nearly five months of actual service in operating an experimental signal upon this principle shows that it is almost absolutely certain in its operation; while it will be apparent upon inspection that, even in the event of its failure to operate, there is no more liability to accident than exists under the present system. The danger signal, once set by a train as it passes a station, cannot be changed to safety except by the arrival of the train at the next station, because the battery current for releasing the signal must come from there, and can only be transmitted by the closing of the circuit by the train itself. If the battery fails, or the wire is interrupted, the signal remains at "danger," and the following train is warned to proceed, if at all, with extreme caution, expecting to meet with obstruction.

If a system of safety signals of this kind can be made at once inexpensive and reliable in its operation, its great value is so apparent as to scarcely need any demonstration. Experience has shown that it is not safe, all things considered, to allow trains to follow each other at the usual rate of speed—say 20 miles or upward per hour—at an interval of less than about seven minutes apart, as in case of an accident or stoppage of a train on the road from any cause, it will require as much as seven minutes for a flagman to go back a sufficient distance to warn the following train of the obstruction in season to prevent a collision. It may also be observed that in the confusion attending an accident this precaution is sometimes forgotten, and instances have been known where the signal, even when sent back, was not seen by the engineer of the approaching train.

With a proper system of signals, erected at intervals of a mile, it would be possible to run trains at intervals of three minutes apart, with far more safety than they can be run at seven minutes apart under present conditions; for it would be absolutely certain that no train could approach within a mile of another one, provided the signals were observed. The capacity of a road would thus be more than doubled, at a very insignificant expense, compared with the expedient of laying down a third track, as is now being done by some of the principal roads running out of Boston, and a greater degree of safety would at the same time be assured.

The system which has been described would not, of course, supersede any of the precautions now in use, but would serve as an additional security. Its applications to tunnels, highway or grade railway crossings, and other dangerous points, are mere matters of difference in detail, which need not be dwelt upon at length in this paper.

In concluding my observations upon this subject, I cannot refrain from mentioning the great credit that is due to some of the leading railway companies in the United States for the prominent part they have taken in the introduction of nearly every important improvement in practical telegraphy which has been made during the past ten years. The use of wires of large size and superior strength and conductivity was commenced by Mr. Tubbs, of the Chicago, Burlington & Quincy Railroad, many years ago, in the face of strenuous opposition on the part of the officers of the commercial telegraph companies; and the good results were so marked as to lead to its continued use by that company in its subsequent construction. Not until last year did the Western Union Telegraph Company commence to use large wire. The Brooks paraffine insulator, which enables a telegraph line of almost any length to be operated without the slightest difficulty in the most unfavorable weather, has been used for several years with entirely satisfactory results by a dozen or more of the principal railroad companies. The Western Union and other commercial companies still continue to use the old glass insulator of a quarter of a century ago, and the result is a great delay, sometimes a total stoppage of communication during the continuance of every rain storm—an inconvenience quietly submitted to by the public, under the erroneous impression that it is unavoidable. So in the matter of batteries the commercial telegraph lines still cling to the costly and inconvenient nitric acid combination, apparently for no other reason than because Morse used it on his first line between Baltimore and Washington, while the railroad companies have long since adopted the simple, economical and effective gravity battery. Other examples of the same nature might be adduced, but enough has been said to show that the managers of the leading American railroads are fully alive to the importance of the employment of that invaluable agent, electricity, in its application to the management and control of their rapidly increasing traffic. A few years will probably witness the general introduction of some system of signaling resembling that which I have endeavored to describe, and which will become an indispensable adjunct to the operations of all roads running a large number of trains in rapid succession over the same track.